APPENDICES

Appendix 1: Statewide Framework for Updating the Hawai'i Water Plan

The Statewide Framework for Updating the Hawai'i Water Plan (Statewide Framework, 2000) for preparation of the WUDP provide guidance to insure effective implementation by the counties and utilization by CWRM for resource management purposes.[1] The Framework-recommended plan elements are intended to:

- **CWRM Coordination.** Be drafted in coordination with CWRM throughout the process, including submittal of the proposed WUDP process and project description to CWRM staff, milestone briefings to CWRM including review of demand methodologies, and discussion of how the State Water Projects Plan and State Agricultural WUDP are integrated.

- **Public Involvement.** Be drafted with substantial and credible public involvement that includes identification of essential stakeholders; gathering, analysis and incorporation of information on community values; work with advisory or other groups, stakeholder interviews; and a documented variety of public outreach methods.

- **Planning Process.** Provide a documented process to develop and refine a set of planning objectives and associated evaluation criteria to compare the efficacy of alternative resource strategies. The process must include essential stakeholders and consider available information on community values regarding water resource issues. Planning issues for which objectives may be developed include: water supply reliability, costs and/or rates, environmental impacts, water quality, appurtenant and correlative water rights, T&C gathering rights and Department of Hawaiian Homelands water rights.

- **Demand Scenarios.** Consider multiple demand scenarios, including low, medium and high forecasts; 1, 2, 3, 4, 5, 10, 15 and 20 year forecasts, and forecasts beyond 20 years if anticipated demand may be close to established sustainable limits. Incorporate least cost planning, consistency of the WUDP and land use plans; resource protection needs and plans; underlying assumptions and data; models or computer programs used in the planning process; existing systems, conveyances, resources, conservation or re-use programs; etc. Forecasts shall incorporate State Water Projects Plan, State Agricultural WUDP, and federal and private water purveyors.

- **Water System Profiles**. Include water system profiles describing supplies, major conveyance facilities, storage reservoirs, re-use programs, conservation programs, any resources committed by the County, and the ability of the current system to meet future demands.

- **Alternatives.** Include screening of resource and supply alternatives by a process that includes initial listing of a broad group of possible options for supply, including new supply, transmission, storage, conservation and use of recycled water; initial screening

[1] http://files.Hawai'i.gov/dlnr/cwrm/planning/framewrk.pdf (July 2016)

of a broad list of options by realistic criteria that is specifically defined. Initial screening should result in a "finalist" group of strategies. Finalist strategies are to be evaluated against uncertainties, contingencies and other defined objectives, with final screening to result in a flexible sequence of supply, infrastructure, storage, transmission, conservation, recycled water, resource protection and other actions to meet the County's water objectives.

- **Modeling Tools.** Describe and document the computerized modeling tools that were instrumental to completing the plan and clearly indicate all of the assumptions that underlie the plan and the sources of all data used in the plan.
- **Implementation Plan.** Include a well-described implementation plan, to include near, medium and long term actions, as well as allowance for flexibility. Implementation of an Integrated Resource Planning (IRP) process should comport with state and county environmental, health and safety laws.

Planning Objectives and Relationship to Statewide Framework

Planning Objective	Planning Objective Description	State Framework for Updating the Hawai'i Water Plan
Sustainability	Maintain Sustainable Resources	Traditional and Customary Gathering Rights, Water Supply Reliability
Resources	Protect Water Resources	Traditional and Customary Gathering Rights, Water Supply Reliability
Streams	Protect and Restore Streams	Water Supply Reliability, Traditional and Customary Gathering Rights, Appurtenant and Correlative Water Rights
Environment	Minimize Adverse Environmental Impacts	Environmental Impacts
Equity	Manage Water Equitably	Appurtenant and Correlative Water Rights
DHHL	Provide for Department of Hawaiian Homelands Needs	DHHL Water Rights, Appurtenant and Correlative Water Rights
Agriculture	Provide for Agricultural Needs	DHHL Water Rights, Traditional and Customary Gathering Rights, Water Supply Reliability

Culture	Protect Cultural Resources	Traditional and Customary Gathering Rights
Availability	Provide Adequate Volume of Water Supply	DHHL Water Rights, Traditional and Customary Gathering Rights, Water Supply Reliability
Quality	Maximize Water Quality	Water Quality
Reliability	Maximize Reliability of Water Service	Water Supply Reliability
Efficiency	Maximize Efficiency of Water Use	Water Supply Reliability
Cost	Minimize Cost of Water Supply	Costs and/or Rates
Viability	Establish Viable Plans	All
Conformity	Maintain Consistency with General and Community Plans	All

Appendix 2: County Plan Policy and Programs Relevant to the WUDP, and Consistency with the Planning Objectives

General Plan

GENERAL PLAN GOAL/OBJECTIVES	GENERAL PLAN POLICIES	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
Goal: Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity Objective 1. Improve the opportunity to experience the natural beauty and native biodiversity of the islands for present and future generations.	a. Perpetuate native Hawaiian biodiversity by preventing the introduction of invasive species, containing or eliminating existing noxious pests, and protecting critical habitat areas. c. Restore and protect forests, wetlands, watersheds, and stream flows, and guard against wildfires, flooding, and erosion. d. Protect baseline stream flows for perennial streams, and support policies that ensure adequate stream flow to support Native Hawaiian aquatic species, traditional kalo cultivation, and self-sustaining ahupua`a.	• Maintain Sustainable Resources • Protect Water Resources • Protect and Restore Streams • Minimize Adverse Environmental Impacts
Objective 2. Improve the quality of environmentally sensitive, locally valued natural resources and native ecology of each island.	i. Restore watersheds and aquifer-recharge areas to healthy and productive status, and increase public knowledge about the importance of watershed stewardship, water conservation, and groundwater protection.	• Protect Water Resources • Protect and Restore Streams
Goal: Maui County will foster a spirit of pono and protect, perpetuate, and reinvigorate its residents' multi-cultural values and traditions to ensure that current and future generations will enjoy the benefits of their rich island heritage. Objective 1. Perpetuate the Hawaiian culture as a vital force in the lives of residents.	c. Promote the use of ahupua'a and moku management practices.	• Protect Water Resources • Protect and Restore Streams • Protect Cultural Resources

GENERAL PLAN GOAL/OBJECTIVES	GENERAL PLAN POLICIES	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
Goal: Maui County's physical infrastructure will be maintained in optimum condition and will provide for and effectively serve the needs of the County through clean and sustainable technologies. Objective 1. Improve water systems to assure access to sustainable, clean, reliable, and affordable sources of water.	a. Ensure that adequate supplies of water are available prior to approval of subdivision or construction documents. b. Develop and fund improved water-delivery systems. c. Ensure a reliable and affordable supply of water for productive agricultural uses. d. Promote the reclamation of gray water, and enable the use of reclaimed, gray, and brackish water for activities that do not require potable water. e. Retain and expand public control and ownership of water resources and delivery systems. f. Improve the management of water systems so that surface-water and groundwater resources are not degraded by overuse or pollution. g. Explore and promote alternative water-source-development methods. h. Seek reliable long-term sources of water to serve developments that achieve consistency with the appropriate Community Plans.	• Maximize Water Quality • Maximize Reliability of Water Service • Minimize Cost of Water Supply • Maximize Water Quality • Maximize Efficiency of Water Use • Provide for Agricultural Needs • Maintain Sustainable Resources • Protect Water Resources • Maintain Consistency with General and Community Plans
Objective 4. Direct growth in a way that makes efficient use of existing infrastructure and to areas where there is available infrastructure capacity.	a. Capitalize on existing infrastructure capacity as a priority over infrastructure expansion. d. Promote land use patterns that can be provided with infrastructure and public facilities in a cost-effective manner. e. Support catchment systems and on-site wastewater treatment in rural areas and aggregated water and wastewater systems in urban areas if they are appropriately located.	• Maximize Efficiency of Water Use • Minimize Cost of Water
Objective 5. Improve the planning and management of infrastructure systems.	a. Provide a reliable and sufficient level of funding to enhance and maintain infrastructure systems. b. Require new developments to contribute their *pro rata* share of local and regional infrastructure costs.	• Manage Water Equitably • Minimize Cost of Water Supply

GENERAL PLAN GOAL/OBJECTIVES	GENERAL PLAN POLICIES	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
	d. Maintain inventories of infrastructure capacity, and project future infrastructure needs. e. Require social-justice and -equity issues to be considered during the infrastructure-planning process. f. Discourage the development of critical infrastructure systems within hazard zones and the tsunami-inundation zone to the extent practical. g. Ensure that infrastructure is built concurrent with or prior to development. h. Ensure that basic infrastructure needs can be met during a disaster.	• Maximize Reliability of Water Service

Maui Island Plan

MIP GOALS/OBJECTIVES	MIP POLICIES	MIP IMPLEMENTATION	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
Goal 6.3 - Maui will have an environmentally sustainable, reliable, safe, and efficient water system. Objective 6.3.1 - More comprehensive approach to water resources planning to effectively protect, recharge, and manage water resources including watersheds, groundwater, streams, and aquifers.	6.3.1.a - Ensure that DWS actions reflect its public trust responsibilities toward water. 6.3.1.b - Ensure the WUDP implements the State Water Code and MIP's goals, objectives, and policies. 6.3.1.c - Regularly update the WUDP, to maintain compliance with the General Plan. 6.3.1.d - Ensure that the County's CIP for water-source development is consistent with the WUDP and the MIP. 6.3.1.e - Where desirable, retain and expand public ownership and management of watersheds and fresh-water systems. 6.3.1.f - Encourage and improve data exchange and coordination among Federal, State, County, and private land use planning and water resource management agencies.	6.3.1-Action 2 - Develop site selection studies for water storage and supply facilities for each community plan area. 6.3.1-Action 3 - Prepare and implement a plan to identify and prioritize infrastructure requirements needed to accommodate nonpotable water for irrigation. 6.3.1-Action 4 -Work with the State to set standards for the amount of water withdrawn from aquifers and other groundwater sources to ensure the long-term health and sustainability of the resource. 6.3.1-Action 5 - Produce an annual evaluation of the state of available water resources on the island.	• Manage Water Equitably • Protect Cultural Resources • Protect and Restore Streams • Maintain Consistency with General and Community Plans
Objective 6.3.2 - Increase the efficiency and capacity of the water systems.	6.3.2.a - Ensure the efficiency of all water system elements including well and stream intakes, water catchment, transmission lines, reservoirs, and all other system infrastructure. 6.3.2.b- Encourage increased education about and use of private catchment systems where practicable for non-potable uses. 6.3.2.c - Maximize the efficient use of reclaimed wastewater to serve nonpotable needs. 6.3.2.d - Work with appropriate State and County agencies to achieve a balance in	6.3.2-Action 1 - Develop programs to increase the efficiency of all water system elements. 6.3.2-Action 2 - Develop, adopt, and implement water source development siting standards that implement the MIP Directed Growth Plan and the WUDP, and protect water quality for existing and future consumers. 6.3.2-Action 3 - Revise County regulations to require high-efficiency, low-flow plumbing fixtures in all new construction.	• Minimize Cost of Water Supply • Maximize Efficiency of Water Use • Maintain Sustainable Resources • Manage Water Equitably

MIP GOALS/OBJECTIVES	MIP POLICIES	MIP IMPLEMENTATION	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
	resolving the needs of water users in keeping with the water allocation priorities of the MIP. 6.3.2.e - Ensure water conservation through education, incentives, and regulations. 6.3.2.f - Acquire and develop additional sources of potable water.	6.3.2-Action 4 - Pursue development of additional potable water sources to keep pace with the County's needs. 6.3.2-Action 5 - Identify and develop renewable energy systems to serve the DWS. 6.3.2-Action 6 - Develop a water rate structure that encourages conservation and discourages the excessive use of water. 6.3.2-Action 7 - Develop a comprehensive water conservation ordinance to include xeriscaping regulations to promote water conservation.	
Objective 6.3.3 - Improve water quality and the monitoring of public and private water systems.	6.3.3.a - Protect and maintain water delivery systems.	6.3.3-Action 1 - Ensure water quality and quantity report results are provided in a timely manner to consumers when water quality or quantity falls below standards. 6.3.3-Action 2 - Complete and implement DWS wellhead-protection program to protect the water quality of public and private wells.	• Protect Water Resources • Maximize Water Quality
Goal 2.3 - Healthy watersheds, streams, and riparian environments.	2.3.1.a - All present and future watershed management plans shall incorporate concepts of ahupua`a management based on the interconnectedness of upland and coastal ecosystems/species.	2.3.1-Action 1 - Develop, regularly update, and adopt watershed management plans for regions of the island not covered by existing plans.	• Maintain Sustainable Resources • Protect Water Resources

MIP GOALS/OBJECTIVES	MIP POLICIES	MIP IMPLEMENTATION	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
Objective 2.3.1 - Greater protection and enhancement of watersheds, streams, and riparian environments.	2.3.1.b - Continue to support and be an active member of watershed partnerships. 2.3.1.c - Support the establishment of regional water trusts, composed of public and private members, to manage water resources. 2.3.1.d - Support regulations to require developments to utilize ahupua`a management practices. 2.3.1.e - Work with private and non-profit entities to educate the public about the connection between upland activities within the watershed and the impacts on nearshore ecosystems and coral reefs. 2.3.1.f - Provide adequate funding and staff to develop and implement watershed protection plans and policies, including acquisition and management of watershed resources and land. 2.3.1.g - Encourage the State to mandate instream assessment to provide adequate water for native species. 2.3.1.h - Maui will protect all watersheds and streams in a manner that guarantees a healthy, sustainable riparian environment.	2.3.1-Action 2 - Work with the State and Federal government to ensure instream assessment to assure the reproductive system/cycle for Native species and for other purposes.	• Protect and Restore Streams • Minimize Adverse Environmental Impacts
Objective 2.3.4 - Greater preservation of native flora and fauna biodiversity to protect native species.	2.3.4.a - Work with appropriate agencies to eliminate feral ungulate populations and invasive species. 2.3.4.b - Encourage the State to provide adequate funding to preserve biodiversity, protect native species, and contain or eliminate invasive species.		• Protect Water Resources

MIP GOALS/OBJECTIVES	MIP POLICIES	MIP IMPLEMENTATION	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
	2.3.4.c - Support the work of conservation groups and organizations that protect, reestablish, manage, and nurture sensitive ecological areas and threatened indigenous ecosystems.		
Objective 2.3.6 - Enhance the vitality and functioning of streams, while balancing the multiple needs of the community.	2.3.6.b - Work with appropriate agencies to establish minimum stream flow levels and ensure adequate stream flow to sustain riparian ecosystems, traditional kalo cultivation, and self-sustaining ahupua`a. 2.3.6.c - Respect and participate in the resolution of native Hawaiian residual land and water rights issues (kuleana lands, ceded lands, and historic agricultural and gathering rights). 2.3.6.e - Work with appropriate agencies and stakeholders to establish minimum stream flow levels, promote actions to support riparian habitat and the use of available lo`i, and maintain adequate flows for the production of healthy kalo crops.	2.3.6-Action 1 - Compile and update data on the needs of the multiple users of water.	• Maintain Sustainable Resources • Protect and Restore Streams • Provide for Agricultural Needs • Protect Cultural Resources • Provide for Department of Hawaiian Homelands Needs • Manage Water Equitably
Objective 6.2.3 - Increase the reuse of wastewater.	6.2.3.a - Strengthen coordination between the Department of Water Supply (DWS) and the WWRD to promote reuse/recycling of wastewater. 6.2.3.b - Expand the reuse of wastewater from the Central Maui, Kīhei, Lahaina, and other wastewater systems.	6.2.3-Action 1 - Identify potential new users of treated effluent and implement the necessary improvements to supply this water through the County CIP. 6.2.3-Action 2 - Amend County regulations to allow for the use of grey water for approved purposes.	• Provide Adequate Volume of Water Supply • Maximize Reliability of Water Service • Maximize Efficiency of Water Use • Minimize Cost of Water Supply

MIP GOALS/OBJECTIVES	MIP POLICIES	MIP IMPLEMENTATION	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
		6.2.3-Action 3 - Create education, marketing, and incentive programs that promote the reuse/recycling of wastewater.	• Establish Viable Plans • Provide for Agricultural Needs • Protect Cultural Resources • Protect and Restore Streams
Goal 6.10 - Maui will meet its energy needs through local sources of clean, renewable energy, and through conservation. Objective 6.10.1 - Reduce fossil fuel consumption by 15 percent from 2005 in 2015; 20 percent by 2020; and 30 percent by 2030.	6.10.1.a - Support energy efficient systems, processes, and methods in public and private operations, buildings, and facilities. 6.10.2.c - Support the establishment of new renewable energy facilities at appropriate locations provided that environmental, view plane, and cultural impacts are addressed. 6.10.2.d - Encourage all new County facilities completed after January 1, 2015, to produce at least 15 percent of their projected electricity needs with onsite renewable energy.	6.10.1-Action 1 - Work with the Energy Management Program to: (1) Audit County facilities, operations, and equipment; (2) Develop programs and projects to achieve greater energy efficiency and reduction in fossil fuel use; (3) Develop and maintain data and reports on island energy consumption; (4) Phase out inefficient fossil-fueled vehicles	• Minimize Cost of Water Supply • Minimize Adverse Environmental Impacts • Maximize Reliability of Water Service
Goal 7.1 - Maui will have a prosperous agricultural industry and will protect agricultural lands. Objective 7.1.2 - Reduction of the island's dependence on off-island agricultural	7.1.2.c - Actively look to acquire land and provide infrastructure to expand the agricultural park and establish new agricultural parks. 7.1.2.f - Support plans and programs to develop additional sources of water for irrigation purposes. 7.1.2.h - Support the recommendations, policies, and actions contained within the	7.1.2-Action 3 - Coordinate with the State Department of Agriculture, the development of an Agricultural Water Strategy, and incorporate an agricultural component in the Water Use and Development Plan. 7.1.2-Action 4 - Coordinate with industry stakeholders to develop alternative sources of irrigation water including wastewater reuse, recycled	• Provide for Agricultural Needs • Minimize Cost of Water Supply • Provide Adequate Volume of Water Supply • Maximize Reliability of Water Service

MIP GOALS/OBJECTIVES	MIP POLICIES	MIP IMPLEMENTATION	CONSISTENCY WITH WUDP PLANNING OBJECTIVES
products and expansion of export capacity.	Maui Agricultural Development Plan, July 2009, when consistent with the MIP. 7.1.2.i - Allow water and tax discounts for legitimate farming operations on rural and agricultural land. 7.1.2.j - Give priority in delivery and use of agricultural water and agricultural land within County agricultural parks to cultivation of food crops for local consumption.	stormwater runoff, and brackish well water.	

Summary of Maui Island Plan Policies Relevant to the WUDP by Topic

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
<u>Water Resources</u> Healthy watersheds, streams, and riparian environments. Greater protection and enhancement of watersheds, streams, and riparian environments. Enhance the vitality and functioning of streams, while balancing the multiple needs of the community. More comprehensive approach to water resources planning to effectively protect, recharge, and manage water resources including watersheds, groundwater, streams, and aquifers. Maui will protect all watersheds and streams in a manner that guarantees a healthy, sustainable riparian environment. Ensure adequate stream flow to sustain riparian ecosystems, adequate water for native species, traditional kalo cultivation, use of available lo`i, and self-sustaining ahupua`a. Greater preservation of native flora and fauna biodiversity to protect native species. All present and future watershed management plans shall incorporate	<u>Water Rights/Public Trust Uses</u> Ensure the WUDP implements the State Water Code and MIP's goals, objectives, and policies. Ensure that DWS actions reflect its public trust responsibilities toward water. Respect and participate in the resolution of native Hawaiian residual land and water rights issues (kuleana lands, ceded lands, and historic agricultural and gathering rights). <u>Potable Water</u> Increase the efficiency and capacity of the water systems. Protect and maintain water delivery systems. Acquire and develop additional sources of potable water. Pursue development of additional potable water sources to keep pace with the County's needs. <u>Nonpotable Water</u> Maximize the efficient use of reclaimed wastewater to serve nonpotable needs. Encourage increased education about and use of private catchment systems where practicable for non-potable uses. <u>Agricultural Irrigation</u> Support plans and programs to develop additional sources of water for irrigation purposes.	<u>Recycled Water</u> Maui will have wastewater systems that … maximize wastewater reuse where feasible. Increase the reuse of wastewater. Maximize the efficient use of reclaimed wastewater to serve nonpotable needs. Encourage increased education about and use of private catchment systems where practicable for non-potable uses. <u>Conservation</u> Ensure water conservation through education, incentives, and regulations. <u>Energy</u> Maui will meet its energy needs through local sources of clean, renewable energy, and through conservation (% goals). Increase the minimum percentage of electricity obtained from clean, renewable energy sources (% goals).

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
concepts of ahupua`a management based on the interconnectedness of upland and coastal ecosystems/species.	Coordinate with industry stakeholders to develop alternative sources of irrigation water including wastewater reuse, recycled stormwater runoff, and brackish well water.	

Summary of Community Plan Policies Relevant to the WUDP by Topic

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
West Maui CP		
Protect ground water resources. Protection and enhancement of native forest and vegetation. Protect cultural and archaeological sites: plantation ditch systems, fishponds, significant native vegetation zones, stream valley areas- lo'i and auwai. Establish a "Watershed Protection Overlay Plan" for West Maui to insure protection of (1) quantity and quality of drinking water supplies; (2) quality of coastal waters and marine resources; (3) the long term economic viability of the community. Include specifications for drainage, erosion control, water conservation, wastewater reuse, and shoreline setbacks as needed to supplement existing policies and rules. Protect all waters and wetland resources to open space and habitat for plant and animal life in the aquatic environment. They are also important for flood control and natural landscape. Establish and maintain programs which control invasive alien plant and animal species	Coordinate water system development to support development within urban growth boundaries. Sufficient water to support ag and native Hawaiian water rights and traditional practices. Encourage maintenance and development of water sources for agricultural uses that do not conflict with domestic demand for potable water. Preserve Honokohau' Valley's historic and traditional use for domestic and agricultural activities. Ensure availability of sufficient quantities and quality of water for these activities by recognizing Native Hawaiian water rights and traditional access. Establish an appropriate supply of urban land within the region to meet the needs of the community over the next 20 years. The Community Plan and its map shall define the urban growth limits for the region and all zoning and/or proposed land uses and developments shall be consistent with the Community Plan and its land use map. Lands north of Kapalua and south of Puamana should ensure the preservation of traditional lifestyles, historic sites, agriculture, recreational activities and open space.	Encourage landscape and ag use of reclaimed wastewater. Promote conservation of potable water via use of reclaimed water for irrigation. Promote water conservation. Incorporate drought-tolerant plant species in future landscape planting. Promote energy conservation and renewables.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
	Encourage and protect traditional shoreline and mountain access, cultural practices and rural/ agricultural lifestyles. Improve the quality of domestic water. Reduce potable water consumption outside urban areas. Improve and expand the West Maui water development program projected by the County to meet future residential expansion needs and establish water treatment facilities where necessary. Study the feasibility of integrating all regional water systems into a public water system to be managed and operated by the County. Encourage reasonable rates for water and public utility services.	
Pa'ia-Ha'iku CP		
Protect quality of surface and groundwater. Protection/enhancement of native forest and vegetation. Protect cultural and archaeological sites: plantation ditch systems, fishponds, significant native vegetation zones, stream valleys. Encourage the restoration and traditional use of taro patches, and the re-establishment of breadfruit groves. Encourage and protect traditional mauka and makai accesses, cultural practices and rural lifestyles. Protect traditional hunting, fishing and gathering.	Improve existing potable water distribution system and new sources prior to expansion of State Urban district boundary of major subdivisions in State Ag or Rural Districts. Ensure adequate water capacity for domestic and ag needs. Ensure the development of new water sources does not adversely affect in-stream flows. Increase water storage capacity with a reserve for drought periods. Ensure adequate supply of groundwater to residents of the region before water is transported to other regions of the island.	Reduce residential home energy and water consumption. Provide incentives for water conservation practices. Promote energy conservation and renewables. Incorporate the principles of xeriscaping in all future landscape planting.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
	Maintain agriculture as the primary economic activity. Propose and define growth limits around existing urbanized areas to accommodate residential development while directing growth in an organized manner. Prepare or update a water improvement master plan. In the WUDP update, include reserve capacity for drought conditions. Develop comprehensive ag water system including use of recycled water and dual water system for domestic and irrigation uses.	
Wailuku-Kahului CP		
Protect water resources in the region from contamination, including protecting ground water recharge areas, and wellhead protection areas within a 1.25-mile radius from the wells. Protect cultural and archaeological sites: 'Iao Stream, taro lo'i terraces in 'Iao Valley, Na Wai 'Eha. Promote and implement programs for ground water and wellhead protection.	Improve the quality of potable water. Preserve agricultural lands as a major element of the open space setting bordering various communities. Preserve and protect native Hawaiian rights and practices customarily and traditionally exercised for subsistence, cultural and religious purposes. Encourage traditional Hawaiian agriculture, such as taro cultivation, within the agricultural district, in areas which have been historically associated with this cultural practice.	Promote conservation of potable water through use of treated waste water effluent for irrigation. Implementing Actions Reuse treated effluent from the County's waste water treatment system for irrigation and other suitable purposes in a manner that is environmentally sound. Promote conservation.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
	Coordinate water system improvement plans with growth areas to ensure adequate supply and a program to replace deteriorating portions of the distribution system. Future growth should be phased to be in concert with the service capacity of the water system. Coordinate expansion of and improvements to the water system to coincide with development of residential expansion areas. Improve the quality of domestic water. Encourage reasonable rates for water and public utility services. Adopt a water allocation plan for the region and require use of water from Central Maui Water System for future development shall be subject to water allocation plan. Plan and construct water system improvements, including additional source, transmission, and storage capabilities.	Provide incentives for water and energy conservation practices. Promote energy conservation and renewables. Incorporate drought tolerant plant species and xeriscaping in future landscape planting.
Hāna CP		
Ensure ground and surface water resources are preserved and maintained at capacities to meet current and domestic, agricultural, commercial, ecological and traditional cultural demands of each area in the Hāna District. Hāna CP – Protect and restore native aquatic habitats and resources within and along all	Improve water source and delivery facilities to ensure water is high quality. Promote and maintain agriculture as a major economic activity with emphasis on a regional diversified agricultural industry. Maintain taro farming, ranching and floriculture as major economic activities. Maintain the visitor industry as a major economic activity.	Comprehensive waste management plan to include recycling of wastewater as one major component. Incorporate the use of gray water, including household recycling, in the County's wastewater reuse strategy.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
streams by protecting existing instream flows and regulating diversions of stream flow. Protect cultural and archaeological sites: plantation ditch systems, fishponds, native vegetation zones, lo'i terraces and ‘auwai. In coordination with native Hawaiian residents and community representatives, prepare watershed management plans and a groundwater and surface water resources monitoring program to protect the district's surface and ground waters, and monitor water levels to meet current and future demands Explore methods to diminish out-of-district diversions of the district's groundwater and/or surface water resources in order to meet current and future domestic, agricultural, commercial, ecological, and traditional cultural needs within the district. Develop regulations and implement programs to protect lo`i kalo (taro terraces), and encourage their productive use. Establish and maintain feral animal control programs, and programs which control invasive alien plant species.	Provide municipal water service to Kipahulu and Upper Nāhiku. Prepare a domestic water system master plan.	Encourage water conservation. Promote energy conservation and renewables.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
Kihei-Makena CP		
Protect plantation ditch systems, fishponds, significant native vegetation zones, Waiohuli Kai fishpond.	Provide source and transmission concurrent with planned growth. Support and expand Central and East Maui water systems. Encourage use of non-potable water for irrigation. Identify priority growth areas to focus public and private provision of infrastructure and amenities to serve existing residents and to accommodate new growth. Allow no further development unless infrastructure, public facilities, and services needed to service new development are available prior to or concurrent with impacts of new development. Cultural protection that preserves and protects native Hawaiian rights customarily and traditionally exercised for subsistence, cultural, and religious purposes. Encourage and protect traditional mauka and makai accesses, cultural practices and rural lifestyles. Provide for the preservation and enhancement of important agricultural lands for a variety of agricultural activities, including sugar cane, diversified agriculture and aquaculture	Encourage use of non-potable water for irrigation purposes and water features. Require use of reclaimed water for irrigation of golf courses, parks and landscaped areas. Prohibit use of potable water in large water features or require substantial mitigation fees. Develop conservation and reuse programs. Encourage use of plants with a relatively low need for water. Promote energy conservation and renewables.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
	Prepare a prioritized island-wide directed and managed growth strategy to ensure development is consistent with provision of infrastructure, public facilities and services.	
Makawao-Pukalani-Kula CP		
Recognize the importance of the forested watershed areas and that their health and well-being are vital to all the residents of the Upcountry area. Support a comprehensive watershed management program which incorporates forest management and reforestation/replanting using endemic and indigenous plant species, protects the environment from exotic plants and animals; and prevents the introduction and establishment of non-native species within this native forest region that may ultimately threaten water supply and native ecosystems. Explore a comprehensive reforestation program to increase and catch more rainwater for the Upcountry area.	Prioritize the allocation of water as new resources and system improvements become available as follows: (a) for maintenance and expansion of diversified agricultural pursuits and for the Department of Hawaiian Homes projects; and then (b) for other uses including development of new housing, commercial and public/quasi-public uses. Encourage a flexible and comprehensive water management approach that recognizes the various collection and delivery improvements as one cohesive system. Restrict the use of any water developed within or imported to the Upcountry region to consumption within the Upcountry region, with exception provided for agricultural use. Recognize and support the immediate allocation of water resources for Department of Hawaiian Home Lands projects and agriculture. Recognize the Department of Hawaiian Home Lands' Waiohuli-Keokea region as a potential agricultural and affordable housing community and the eventuality of a Hawaiian sovereign entity.	Explore the development of alternative water sources (e.g., grey water, catchment systems, etc.) to meet the needs of diversified agriculture, businesses and residents. Promote agricultural practices that encourage energy efficient and environmentally sound measures such as catchment systems, and use of grey water, organic pesticides, organic fertilizers and biomass energy. Support wastewater reclamation and grey water alternatives as a means of reducing demands upon limited water resources in the Upcountry region. Support the development of separate domestic and irrigation water systems. DWS shall expand water supply and distribution systems, including catchment systems.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
	Seek expanded municipal withdrawal from the lowest cost source to serve the Upcountry region. Support programs and plans to develop adequate water systems for agricultural use. The Department of Water Supply shall expand water supply and distribution systems, including catchment systems, in accordance with the Community Plan. Encourage the construction of additional storage capacity by the DWS, commercial developers, and individual farmers to help alleviate the inadequate water supply. Establish water resource availability as a major criteria in establishing land uses. Support the development of separate domestic and irrigation water systems. Encourage cooperative efforts among Federal, State, and County agencies, and developers to ensure that water storage and delivery needs of the region are met in a timely and orderly manner. Encourage the construction of additional storage capacity by the DSW, commercial developers, and individual farmers to help alleviate the inadequate water supply. Increase the deliverable capacity of the lower Kula line to 7.5 mgd and extend the line to Keokea to serve Department of Hawaiian Home Lands projects.	Increase catchment efficiency and storage capacity on the upper Kula line to achieve 4 mgd sustained delivery to farms and residences. Utilize treated effluent for irrigation of farms, golf courses, parks and highway landscaping. Provide incentives for water conservation practices. Provide tax and/or water rate incentives for construction of agricultural water storage facilities. Implement a water conservation and education program. Require the use of low water consuming trees, plants and ground covers in future landscape planting. Promote conservation and efficiency as the energy resource of first choice.

Water Resources	Water Availability and Uses	Supply Augmentation / Demand Controls
	Systematically improve and upgrade the existing water delivery system. Increase the pumping capacity from low cost sources to upper areas to supplement the surface water supply. Develop and execute an agreement which ensures for the County, long-term rights to water from the lowest cost sources. Conduct a groundwater development feasibility study for the Upcountry region.	Study and identify opportunities, including tax incentives, for developing alternative energy sources such as wind, biomass, solar and water driven electricity in the Upcountry region.

Appendix 3: Hawaiian Homes Commission Water Policy Plan

HAWAIIAN HOMES COMMISSION WATER POLICY PLAN

July 22, 2014

Policies

The HHC and the DHHL are seeking to be proactive in our management of water. Our Priority Policies are to:

1. Expressly determine and plan for future water needs and actively participate in broader water management, use and protection efforts in Hawai`i in order to secure water.
2. Aggressively exercise, reclaim, and protect Hawaiian home land water kuleana.
3. Develop, manage, and steward water in a manner that balances cost, efficiency measures, and Public Trust uses in the short and long term.
4. Affirmatively communicate our decisions, our reasoning, and our performance in managing, stewarding, and using water before and after making major water decisions.

Additionally, the HHC and the DHHL should consider in their work the following statements:

5. Educate beneficiaries, the DHHL, HHC, and other stakeholders continually on our water kuleana.
6. Foster self-sufficiency of beneficiaries by promoting the adequate supply of water for homesteading when developing or managing water.
7. Foster the self-determination of beneficiaries by seeking ways for beneficiaries to participate in the management of water by delegating authority related to water subject to the discretion of the HHC as described in the HHCA.
8. Make water decisions that incorporate traditional and place-based knowledge of our people and are clear and methodical in their reasoning.
9. Make efforts to understand, maintain, and improve the quality of water as it moves into and through our lands and is used by beneficiaries.
10. Affirmatively consider the development and use of alternative sources of water and efficiency measures in water decision-making.
11. Ensure that water decisions are consistent with other Departmental policies, programs, and plans including but not limited to the Energy Policy and Agricultural Program.
12. Explicitly consider water availability and the costs to provide adequate water when developing new homestead areas, designating land uses, issuing land dispositions, or exchanging properties.

Goals

To make progress on achieving our Mission and complying with our Policies, the Priority Goals of the HHC and the DHHL are to:

1. Affirmatively communicate with beneficiaries regarding water decisions, performance, and water rights on a regional and annual basis.
2. Aggressively, proactively, consistently and comprehensively advocate for the kuleana of the beneficiaries, the DHHL, and the HHC to water before all relevant agencies and entities.
3. Develop and manage a Water Assets Inventory (WAI).
4. Support watershed protection and restoration on DHHL lands and source areas for DHHL water.

Additional goals that DHHL and the HHC shall seek to achieve, based on the availability of resources, organized by Mission activities, are:

Part I. Understand our trust water assets

1. Revise the DHHL submittal template to the HHC for water related decisions.
2. Revise budgets to show the total costs of a) water system management b) all spending on water issues.
3. Staff and organize the DHHL consistent with importance of water to the trust.

Part II. Plan for our water needs

4. Determine current and foreseeable future needs based upon periodic reviews of water availability projections that incorporate climate change, projected beneficiary demand, alternative sources and efficiency measures.
5. Design homesteads and manage lands to create and enhance water availability, optimizing costs, use of alternative sources and efficiency measures.

Part III. Aggressively understand, exercise and assert our water rights

6. Secure adequate and enforceable reservations of water for current and foreseeable future needs for all of its lands across the islands.
7. Partner with trust beneficiaries in water advocacy efforts.
8. Engage in updates to all Hawai`i Water Plan elements to ensure DHHL water needs and rights are addressed.
9. Advocate that all Water Use Permit Applications properly address the water rights of DHHL and other Hawaiian water rights.
10. Advocate that County Boards of Water Supply and other County agencies that affect water have the spirit of the HHCA faithfully carried out to protect DHHL

Appendix 4: Inventory of Surface Water Resources

The table below lists key characteristics of each hydrologic unit, including the total area (in square miles), the number of registered and/or permitted stream diversions, the number of historic and currently active USGS gages within the unit, and the current interim IFS. In most cases the current interim IFS were established pursuant to amendments to HAR §13-169 as follows. The right-hand column provides the status of the IFS as of August 2016.

- Interim Instream Flow Standard for East Maui, HAR §13-169-44
  Date of Adoption: 6/15/1988
  Effective Date: 10/8/1988

- Interim Instream Flow Standard for West Maui, HAR §13-169-48
  Date of Adoption: 10/19/1988
  Effective Date: 12/10/1988

Inventory of Surface Water Resources

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
6001	Waikapu	Waikapu	16.4	12	4	0	2.9mgd below S. Waikapu Ditch return	
6002	Pohakea	Waikapu	8.31	0	1	0	HAR §13-169-48	
6003	Papalaua	Ukumehame	4.88	0	0	0	HAR §13-169-48	
6004	Ukumehame	Ukumehame	8.28	1	2	0	HAR §13-169-48	
6005	Olowalu	Olowalu	8.4	2	3	0	HAR §13-169-48	
6006	Launiupoko	Launiupoko	6.6	1	1	0	HAR §13-169-48	
6007	Kauaula	Launiupoko	8.44	1	5	0	HAR §13-169-48	
6008	Kahoma	Launiupoko	8.5	7	8	0	HAR §13-169-48	
6009	Wahikuli	Honokowai	9.79	0	0	0	HAR §13-169-48	

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
6010	Honokowai	Honokowai	8.86	2	6	0	HAR §13-169-48. Amended to include SCAP MA-117 on Honokowai Stream for the installation of a flow-through desilting basin (8/17/1994).	
6011	Kahāna	Honokahua	9.07	1	1	0	HAR §13-169-48	
6012	Honokahua	Honokahua	5.35	0	0	0	HAR §13-169-48	
6013	Honolua	Honolua	4.79	4	4	0	HAR §13-169-48	
6014	Honokohau	Honokohau	11.58	8	2	1	HAR §13-169-48	
6015	Anakaluahine	Honokohau	2.73	0	0	0	HAR §13-169-48	
6016	Poelua	Kahakuloa	2.02	0	2	0	HAR §13-169-48	
6017	Honanana	Kahakuloa	4.66	2	0	0	HAR §13-169-48	
6018	Kahakuloa	Kahakuloa	4.24	10	3	1	HAR §13-169-48. Amended to include SCAP MA-133 on Kahakuloa Stream for reconstruction of an existing stream diversion (6/2/1994).	
6019	Waipili	Waihe'e	2.65	2	0	0	HAR §13-169-48	
6020	Waiolai	Waihe'e	0.97	1	0	0	HAR §13-169-48	
6021	Makamakaole	Waihe'e	2.28	4	2	0	HAR §13-169-48	
6022	Waihe'e	Waihe'e	7.11	5	4	1	10mgd below Waihe'e Ditch intake and 10mgd	

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
							below Spreckels Ditch intake	
6023	Waiehu	'Iao	10.14	12	5	0	1.6mgd below N. Waiehu Ditch intake on N. Waiehu and 0.9mgd below Spreckels Ditch intake on S. Waiehu	
6024	'Iao (Wailuku)	'Iao	22.55	9	6	1	10mgd below 'Iao-Waikapu Ditch at Kepaniwai Park and 5mgd at the stream mouth	
6025	Kalialinui	Makawao	30.28	0	3	0	HAR §13-169-44	
6026	Kailua Gulch	Makawao	29.76	0	0	0	HAR §13-169-44	
6027	Maliko	Ha'iku	27.38	10	2	0	HAR §13-169-44	
6028	Kuiaha	Ha'iku	8.38	30	0	0	HAR §13-169-44	
6029	Kaupakulua	Ha'iku	3.84	15	2	0	HAR §13-169-44	
6030	Manawaiiao	Ha'iku	2.37	3	0	0	HAR §13-169-44	
6031	Uaoa	Ha'iku	2.39	6	0	0	HAR §13-169-44	

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
6032	Kealii	Ha'iku	0.53	4	0	0	HAR §13-169-44	
6033	Kakipi	Ha'iku	9.53	21	8	0	HAR §13-169-44	
6034	Honopou	Honopou	2.73	23	9	1	2.31mgd below Ha'iku Ditch and 1.49 below taro diversions	Contested Case CCH-MA13-01, A&B to restore 100% streamflow
6035	Hoolawa	Honopou	4.86	37	2	0	HAR §13-169-44	
6036	Waipio	Honopou	1.03	15	0	0	HAR §13-169-44	
6037	Hanehoi	Honopou	1.43	12	0	0	0.09 below Ha'iku Ditch on Huelo tributary, 0.69 below Ha'iku Ditch, 0.74mgd above community pipe, 2.21mgd at terminal waterfall	Contested Case CCH-MA13-01, A&B to restore 100% streamflow to Hanehoi (Puolua)
6038	Hoalua	Honopou	1.24	4	0	0	HAR §13-169-44	
6039	Hānawana	Honopou	0.65	5	0	0	HAR §13-169-44	
6040	Kailua	Honopou	5.25	6	13	0	HAR §13-169-44	
6041	Nailiilihaele	Waikamoi	3.57	12	8	0	HAR §13-169-44	
6042	Puehu	Waikamoi	0.36	1	0	0	HAR §13-169-44	
6043	Oopuola	Waikamoi	1.24	15	4	0	HAR §13-169-44	
6044	Kaaiea	Waikamoi	1.15	3	1	0	HAR §13-169-44	
6045	Punaluu	Waikamoi	0.22	1	0	0	HAR §13-169-44	
6046	Kolea	Waikamoi	0.71	8	3	0	0.13mgd at Hāna Hwy	Contested Case CCH-MA13-01

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
6047	Waikamoi	Waikamoi	5.3	11	10	0	1.81mgd at Hāna Hwy	Contested Case CCH-MA13-01, A&B to restore 100% streamflow
6048	Puohokamoa	Waikamoi	3.18	8	12	0	0.26mgd at Hāna Hwy	Contested Case CCH-MA13-01
6049	Haipuaena	Waikamoi	1.59	5	9	0	0.06mgd at Hāna Hwy	Contested Case CCH-MA13-01
6050	Punalau	Waikamoi	1.16	3	2	0	HAR §13-169-44	Contested Case CCH-MA13-01
6051	Honomanu	Waikamoi	5.6	8	5	0	0.00mgd at Hāna Hwy	Contested Case CCH-MA13-01
6052	Nuaailua	Waikamoi	1.56	2	0	0	2.00mgd below Ko'olau Ditch	Contested Case CCH-MA13-01
6053	Piinaau	Ke'anae	21.95	14	2	0	HAR §13-169-44	Contested Case CCH-MA13-01, A&B to restore 100% streamflow to Piiinaau & Palahulu
6054	Ohia	Ke'anae	0.28	1	0	0	2.97mgd at Hāna Hwy	Contested Case CCH-MA13-01
6055	Waiokamilo	Ke'anae	2.47	18	0	0	3.17mgd below Ko'olau Ditch	Fully restored in 2007 (CCHMA1301-20141230-HC&S-WL)
6056	Wailuanui	Ke'anae	6.05	8	3	1	4.03mgd at Hāna Hwy	Contested Case CCH-MA13-01, Streamflow restored by A&B
6057	W. Wailuaiki	Ke'anae	4.18	1	1	1	2.46mgd (wet) and 0.40mgd (dry) seasonal at Hāna Hwy	Contested Case CCH-MA13-01
6058	E. Wailuaiki	Ke'anae	3.52	1	1	0	2.39mgd (wet) and 0.13mgd (dry)	Contested Case CCH-MA13-01
6059	Kopiliula	Ke'anae	5.2	2	1	0	HAR §13-169-44. Temporarily amended to include SCAP MA-352 on Kopiliula Stream for the	Contested Case CCH-MA13-01

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
							implementation of a Land Restoration Plan (11/20/2002).	
6060	Waiohue	Ke'anae	0.82	3	1	0	2.07mgd at Hāna Hwy	Contested Case CCH-MA13-01
6061	Paakea	Ke'anae	1.05	2	1	0	0.97mgd at Hāna Hwy	Contested Case CCH-MA13-01
6062	Waiaaka	Ke'anae	0.19	1	2	0	0.00mgd at Hāna Hwy	Contested Case CCH-MA13-01
6063	Kapaula	Ke'anae	0.84	2	2	0	0.13mgd at Hāna Hwy	Contested Case CCH-MA13-01
6064	Hānawi	Ke'anae	5.6	6	2	1	0.06mgd at Hāna Hwy	Contested Case CCH-MA13-01
6065	Makapipi	Ke'anae	3.32	3	3	0	0.60mgd at Hāna Hwy	Contested Case CCH-MA13-01
6066	Kuhiwa	Kuhiwa	3.41	0	0	0	HAR §13-169-44	
6067	Waihole	Kuhiwa	0.88	2	0	0	HAR §13-169-44	
6068	Manawaikeae	Kuhiwa	0.52	0	0	0	HAR §13-169-44	
6069	Kahawaihapapa	Kuhiwa	3.73	0	0	0	HAR §13-169-44	
6070	Keaaiki	Kuhiwa	1.03	2	0	0	HAR §13-169-44	
6071	Waioni	Kuhiwa	0.63	2	0	0	HAR §13-169-44	
6072	Lanikele	Kuhiwa	0.7	1	0	0	HAR §13-169-44	
6073	Heleleikeoha	Kuhiwa	3.48	14	0	0	HAR §13-169-44	
6074	Kawakoe	Kawaipapa	4.04	15	0	0	HAR §13-169-44	
6075	Honomaele	Kawaipapa	7.94	4	1	0	HAR §13-169-44	
6076	Kawaipapa	Kawaipapa	10.78	0	2	0	HAR §13-169-44	
6077	Moomoonui	Kawaipapa	2.95	0	1	0	HAR §13-169-44	
6078	Haneoo	Kawaipapa	2.13	0	0	0	HAR §13-169-44	

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
6079	Kapia	Kawaipapa	4.71	3	0	0	HAR §13-169-44	
6080	Waiohonu	Waihoi	7.15	0	1	0	HAR §13-169-44	
6081	Papahawahawa	Waihoi	1.96	0	0	0	HAR §13-169-44	
6082	Alaalaula	Waihoi	0.48	2	0	0	HAR §13-169-44	
6083	Wailua	Waihoi	1.26	4	0	0	HAR §13-169-44	
6084	Honolewa	Waihoi	0.63	1	0	0	HAR §13-169-44	
6085	Waieli	Waihoi	0.96	0	0	0	HAR §13-169-44	
6086	Kakiweka	Waihoi	0.34	1	0	0	HAR §13-169-44	
6087	Hahalawe	Waihoi	0.74	1	1	0	HAR §13-169-44	
6088	Puaaluu	Kipahulu	0.53	4	0	0	HAR §13-169-44	
6089	Oheo	Kipahulu	9.7	0	2	1	HAR §13-169-44	
6090	Kalena	Kipahulu	0.71	1	0	0	HAR §13-169-44	
6091	Koukouai	Kipahulu	4.56	2	0	0	HAR §13-169-44	
6092	Opelu	Kipahulu	0.53	2	0	0	HAR §13-169-44	
6093	Kukuiula	Kipahulu	0.74	1	1	0	HAR §13-169-44	
6094	Kaapahu	Kipahulu	0.5	0	0	0	HAR §13-169-44	
6095	Lelekea	Kipahulu	0.78	0	0	0	HAR §13-169-44	
6096	Alelele	Kipahulu	1.2	0	0	0	HAR §13-169-44	
6097	Kalepa	Kipahulu	0.97	2	0	0	HAR §13-169-44	
6098	Nuanuaaloa	Kipahulu	4.24	3	0	0	HAR §13-169-44	
6099	Manawainui	Kipahulu	5.17	3	0	0	HAR §13-169-44	
6100	Kaupo	Kaupo	22.5	1	0	0	HAR §13-169-44	
6101	Nuu	Nakula	10.48	0	1	0	HAR §13-169-44	
6102	Pahihi	Nakula	7.85	0	0	0	HAR §13-169-44	
6103	Waiopai	Nakula	5.38	0	0	0	HAR §13-169-44	
6104	Poopoo	Nakula	1.92	0	0	0	HAR §13-169-44	

Unit	Unit Name	Aquifer System	Area (mi^2)	No. of Diversions	No. of Gages	Active Gages	Interim IFS	Status
6105	Manawainui Gulch	Nakula	6.07	0	0	0	HAR §13-169-44	
6106	Kipapa	Lualailua	28.42	0	1	0	HAR §13-169-44	
6107	Kanaio	Lualailua	34.11	0	0	0	HAR §13-169-44	
6108	Ahihi Kinau	Kamaole	3.68	0	0	0	HAR §13-169-44	
6109	Mooloa	Kamaole	1.9	0	0	0	HAR §13-169-44	
6110	Wailea	Kamaole	35.76	4	2	0	HAR §13-169-44	
6111	Hapapa	Kamaole	40.89	0	1	0	HAR §13-169-44	
6112	Waiakoa	Pa'ia	55.76	0	2	0	HAR §13-169-44	

Appendix 5: The State Water Projects Plan Update, Hawai'i Water Plan, Department of Hawaiian Homelands, Final Report, May 2017

DHHL Non-Potable Demands for Surface Water Hydrologic Units, 2031

Unit Code	Surface Water Hydrologic Unit Name	Declared Use[1] (MGD)	2031 NP-WD Dmd by Source[2] (MGD)	Transfers[3] (MGD)	2031 NP-WD Dmd by Location[4] (MGD)	2031 NP Dmd by Location[5] (MGD)
6001	Waikapu	2.507	0.000		0.000	0.000
6004	Ukumehame	4.888	0.000		0.000	0.000
6005	Olowalu	4.556	0.000		0.000	0.000
6006	Launiupoko	0.728	0.000		0.000	0.000
6007	Kauaula	6.008	0.000		0.000	0.000
6008	Kahoma	5.626	0.000		0.000	0.000
6010	Honokowai	0.000	2.081	-2.081	0.000	2.081
6011	Kahana	1.099	0.000		0.000	0.000
6013	Honolua	0.000	0.000	1.040	1.040	0.000
6014	Honokohau	0.011	0.000	1.040	1.040	0.000
6017	Honanana	0.006	0.000		0.000	0.000
6018	Kahakuloa	0.004	0.000		0.000	0.000
6019	Waipili	0.027	0.000		0.000	0.000
6021	Makamakaole	0.007	0.000		0.000	0.000
6022	Waihee	9.727	0.000		0.000	0.000
6023	Waiehu	0.105	0.000		0.000	0.000
6024	Iao	22.833	0.000		0.000	0.000
6027	Maliko	0.014	0.000		0.000	0.000
6028	Kuiaha	0.002	0.000		0.000	0.000
6029	Kaupakulua	0.012	0.000		0.000	0.000
6032	Kealii	0.001	0.000		0.000	0.000
6033	Kakipi	0.155	0.000		0.000	0.000
6034	Honopou	1.327	0.000		0.000	0.000
6035	Hoolawa	0.133	0.000		0.000	0.000
6036	Waipio	0.050	0.000		0.000	0.000

Unit Code	Surface Water Hydrologic Unit Name	Declared Use[1] (MGD)	2031 NP-WD Dmd by Source[2] (MGD)	Transfers[3] (MGD)	2031 NP-WD Dmd by Location[4] (MGD)	2031 NP Dmd by Location[5] (MGD)
6037	Hanehoi	0.007	0.000		0.000	0.000
6047	Waikamoi	0.000	0.000	0.289	0.289	0.000
6049	Haipuaena	0.000	0.000	0.289	0.289	0.000
6051	Honomanu	0.017	0.000		0.000	0.000
6053	Piinaau	0.378	4.588		4.588	4.588
6055	Waiokamilo	0.023	0.000	2.280	2.280	0.000
6056	Wailuanui	0.002	2.280	-2.280	0.000	2.280
6064	Hanawi	0.303	0.000		0.000	0.000
6067	Waihole	0.001	0.000		0.000	0.000
6073	Heleleikeoha	0.001	0.000		0.000	0.000
6074	Kawakoe	0.002	0.000		0.000	0.000
6075	Honomaele	0.000	0.209		0.209	1.083
6076	Kawaipapa	0.000	0.046		0.046	0.947
6079	Kapia	0.002	0.000		0.000	0.000
6082	Alaalaula	0.007	0.000		0.000	0.000
6083	Wailua	0.101	0.000		0.000	0.000
6088	Puaaluu	0.112	0.000		0.000	0.000
6097	Kalepa	0.018	0.000		0.000	0.000
6099	Manawainui	0.004	0.000		0.000	0.000
6106	Kipapa	0.000	0.014		0.014	0.014
6107	Kanaio	0.000	0.000		0.000	0.255
6108	Ahihi Kinau	0.000	0.000		0.000	0.479
6110	Wailea	0.000	0.096	-0.096	0.000	3.317
6111	Hapapa	0.000	0.482	-0.482	0.000	10.657
6112	Waiakoa	0.000	1.856		1.856	1.856
	Total	**60.804**	**11.652**	**0.000**	**10.033**	**27.557**

1. Declared use based on CWRM declaration files and as listed in the WRPP Appendix C
2. Water Development Demand by Source represents the non-potable demands produced within a hydrologic unit used to determine water development strategies within the 20-year planning window
3. Transfers represent the difference between water used and water produced within each hydrologic unit, e.g. a positive value represents a net inflow of water to a hydrologic unit
4. Water Development Demand by Location represents the non-potable demands used within the land area of a hydrologic unit used to determine water development strategies within the 20-year planning window
5. Demand by Location represents the total non-potable demands, including General Agriculture demands, used within the land area of a hydrologic unit not anticipated to be developed within the 20-year planning windo

Appendix B: Potable DHHL Demands – Medium Projection

Island	Aquifer Sector	Aquifer System	Project Name	Total Project Potable Demand (mgd)							
				2012	2013	2014	2015	2016	2021	2026	2031
MAUI	CENTRAL	KAHULUI	PU'UNENE	0.0000	0.0000	0.0000	0.0000	1.7340	1.7340	1.7340	1.7340
MAUI	CENTRAL	KAMA'OLE	KĒŌKEA/WAIOHULI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.4608	0.4608
MAUI	CENTRAL	KAMA'OLE	KĒŌKEA-WAIOHULI DEVELOPMENT PHASE 1-4	0.0000	0.0000	0.0000	0.0000	0.0960	0.3489	0.3489	0.3489
MAUI	CENTRAL	KAMA'OLE	'ULUPALAKUA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0034
MAUI	CENTRAL	KAMA'OLE	KUALAPA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	CENTRAL	KAMA'OLE	KALIHI/KANAHENA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
			Total Central	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.8300**	**2.0829**	**2.5437**	**2.5471**
MAUI	HĀNA	KAWAIPAPA	WĀKIU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0325	0.0565	0.1177
			Total Hāna	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0325**	**0.0565**	**0.1177**
MAUI	KAHIKINUI	LUALA'ILUA	'ĀHIHI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	KAHIKINUI	LUALA'ILUA	KAHIKINUI	0.0000	0.0000	0.0000	0.0000	0.0630	0.0630	0.0630	0.0630
			Total Kahikinui	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0630**	**0.0630**	**0.0630**	**0.0630**
MAUI	KO'OLAU	KE'ANAE	KE'ANAE	0.0000	0.0000	0.0000	0.0000	0.0000	0.0034	0.0034	0.0034
MAUI	KO'OLAU	KE'ANAE	WAILUA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
			Total Ko'olau	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0034**	**0.0034**	**0.0034**
MAUI	LAHAINA	HONOKŌWAI	HONOKŌWAI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0612	0.3179	0.3179
MAUI	LAHAINA	HONOKŌWAI	KĀ'ANAPALI, HONOKŌWAI	0.0000	0.0000	0.0000	0.0000	0.3000	0.3000	0.3000	0.3000
MAUI	LAHAINA	HONOKŌWAI	LEIALI'I 1B	0.0000	0.0000	0.0000	0.0000	0.0000	0.1517	0.1517	0.1517
			Total Lahaina	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.3000**	**0.5129**	**0.7696**	**0.7696**
MAUI	WAILUKU	'ĪAO	WAIEHU	0.0000	0.0000	0.0000	0.0000	0.0170	0.0170	0.0170	0.0170
MAUI	WAILUKU	'ĪAO	PAUKŪKALO	0.0000	0.0000	0.0000	0.0000	0.0034	0.0034	0.0034	0.0034
MAUI	WAILUKU	'ĪAO	WAILUKU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
			Total Wailuku	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**0.0204**	**0.0204**	**0.0204**	**0.0204**
			Total Maui	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**2.2134**	**2.7151**	**3.4566**	**3.5212**

Appendix C: Non-Potable DHHL Demands for Water Development - Medium Projection

Island	Unit Code	Surface Water Hydrologic Unit	Project Name	Total Project Non-Potable Demand (mgd)							
				2012	2013	2014	2015	2016	2021	2026	2031
MAUI	6010	HONOKOWAI	HONOKOWAI	0.0000	0.0000	0.0000	0.0000	0.0000	2.0808	2.0808	2.0808
MAUI	6010	HONOKOWAI	KAANAPLAI, HONOKOWAI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6023	WAIEHU	WAIEHU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6024	IAO	PAUKUKALO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6024	IAO	WAILUKU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6053	PIINAAU	KEANAE	0.0000	0.0000	0.0000	0.0000	0.0000	4.5878*	4.5878*	4.5878*
MAUI	6056	WAILUANUI	WAILUA	0.0000	0.0000	0.0000	0.0000	0.0000	2.2802*	2.2802*	2.2802*
MAUI	6075, 6076	HONOMAELE, KAWAIPAPA	WAIKU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2550
MAUI	6106	KIPAPA	KAHIKINUI	0.0000	0.0000	0.0000	0.0000	0.0135	0.0135	0.0135	0.0135
MAUI	6107	KANAIO	AHIHI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6108	AHIHI KINAU	KUALAPA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6108	AHIHI KINAU	KALIHI/KANAHENA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6110	WAILEA	ULUPALAKUA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6110, 6111	WAILEA, HAPAPA	KEOKEA-WAIOHULI DEVELOPMENT PHASE 1-4	0.0000	0.0000	0.0000	0.0000	0.0000	0.5780	0.5780	0.5780
MAUI	6111	HAPAPA	KEOKEA/WAIOHULI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6112	WAIAKOA	PUUNENE	0.0000	0.0000	0.0000	0.0000	1.8564	1.8564	1.8564	1.8564
			Total Maui	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.8699**	**11.3967**	**11.3967**	**11.6517**

*Part or all of water demand based on estimated lo'i kalo area; subject to change when quantity of available resources are determined

Appendix D demand is not included within the water demand strategies and is not anticipated to be developed within the 20-year planning window

Appendix D: Non-Potable DHHL Demands - Medium Projection

Island	Unit Code	Surface Water Hydrologic Unit	Project Name	Total Project Non-Potable Demand (mgd)							
				2012	2013	2014	2015	2016	2021	2026	2031
MAUI	6008	KAHOMA	LEALII 1B	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6010	HONOKOWAI	HONOKOWAI	0.0000	0.0000	0.0000	0.0000	0.0000	2.0808	2.0808	2.0808
MAUI	6010	HONOKOWAI	KAANAPLAI, HONOKOWAI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6023	WAIEHU	WAIEHU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6024	IAO	PAUKUKALO	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6024	IAO	WAILUKU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6053	PIINAAU	KEANAE	0.0000	0.0000	0.0000	0.0000	0.0000	4.5878*	4.5878*	4.5878*
MAUI	6056	WAILUANUI	WAILUA	0.0000	0.0000	0.0000	0.0000	0.0000	2.2802*	2.2802*	2.2802*
MAUI	6075, 6076	HONOMAELE, KAWAIPAPA	WAIKU	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	2.0298
MAUI	6106	KIPAPA	KAHIKINUI	0.0000	0.0000	0.0000	0.0000	0.0135	0.0135	0.0135	0.0135
MAUI	6107	KANAIO	AHIHI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2550
MAUI	6108	AHIHI KINAU	KUALAPA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.1391
MAUI	6108	AHIHI KINAU	KALIHI/KANAHENA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.3400
MAUI	6110	WAILEA	ULUPALAKUA	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
MAUI	6110, 6111	WAILEA, HAPAPA	KEOKEA/WAIOHULI	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	13.3960
MAUI	6110, 6111	WAILEA, HAPAPA	KEOKEA-WAIOHULI DEVELOPMENT PHASE 1-4	0.0000	0.0000	0.0000	0.0000	0.0000	0.5780	0.5780	0.5780
MAUI	6112	WAIAKOA	PUUNENE	0.0000	0.0000	0.0000	0.0000	1.8564	1.8564	1.8564	1.8564
			Total Maui	**0.0000**	**0.0000**	**0.0000**	**0.0000**	**1.8699**	**11.3967**	**11.3967**	**27.5566**

*Part or all of water demand based on estimated lo'i kalo area; subject to change when quantity of available resources are determined

Appendix H: Estimated County Water Department Charges – Medium Projection

Island	Project Name	Estimated County Water Department Charges ($)								Strategy Option
		2012	2013	2014	2015	2016	2021	2026	2031	

MAUI	ULUPALAKUA	$0	$0	$0	$0	$0	$0	$0	$72,360	REMAIN - MDWS
MAUI	WAIKU	$0	$0	$0	$0	$0	$180,900	$0	$964,800	REMAIN - MDWS
MAUI	KEANAE	$0	$0	$0	$0	$0	$72,360	$0	$0	REMAIN - MDWS
MAUI	WAIEHU	$0	$0	$0	$0	$349,740	$0	$0	$0	REMAIN - MDWS
MAUI	PAUKUKALO	$0	$0	$0	$0	$72,360	$0	$0	$0	REMAIN - MDWS

Appendix 6: Hawai'i Climate Change Adaptation Priority Guidelines Tools

Adaptive Tool (Lead Agency)	Description
Policy and Planning Tools	
Incorporate Climate Change Planning Into the Hawai'i Water Plan (CWRM)	WUDP planning scenarios should include potential variations in future precipitation and temperature along with population and land use scenarios into a strategic decision making process that addresses uncertainties, environmental externalities and public needs.
Enforce Five-Year Updates to the Hawai'i Water Plan (CWRM)	The 20 year time horizon should be reviewed. Climate change phenomena implicate trends much longer than 20 years and some water infrastructure is designed to last more than 20 years.
Expand Models of Water- and Climate-Conscious Land Use Plans and Policies (County Council)	Counties should adopt appropriate policies, ordinances, and plans to more fully integrate land use and water planning (e.g.: Maui County Water Availability Policy). There are potentially gaps between sustainable yield and demand under the county land use plans; WUDPs should identify potential steps and barriers for avoiding over-allocation, such as implementing demand-side conservation measures, developing non-potable water resources, or transferring water between hydrologic units.
Adopt Existing Models to Integrate Watershed Conservation with Water Resource Planning (DWS)	Initial steps toward compiling mandatory water conservation and recycling plans should be finalized and implemented by each county. Hawai'i Act 152 relating to Watershed Protection required the development of a watershed protection master plan to identify and protect priority watersheds. Monitoring and planning for specific impacts on watersheds is consistent with sustainability and the principles of the ahupua'a system.
Finalize and Implement Mandatory Water Conservation and Recycling Plans (DWS)	Water conservation is a critical component of climate adaptation and water resource management. Hawai'i can increase its resilience to declining water supply or more frequent drought, by implementing mandatory water conservation and recycling (e.g., Maui conservation policy).
Regulatory Tools	
Adopt Climate-Conscious Sustainable Yield and Instream Flow Standards (CWRM)	Sustainable yield and instream flow should account for climate change and potential impacts, and they should be regularly reevaluated.
Expand Water Management Areas (CWRM)	Under the Water Code, more adaptive tools and strategies are applicable in WMAs than in non-designated areas. Protection against climate hazards is enhanced by the designation of WMAs for both surface water and groundwater resources.
Adopt More Adaptive Conditions for Water Use, Well Construction, and Stream Diversion Permits (CWRM)	The standard and special conditions applicable to such permits should be amended to enhance adaptive capabilities such as monitoring and forward-looking flexibility. Proposed amendments are suggested, to empower use monitoring, rain and stream monitoring, and permit compliance inspections.
Market-Based Tools	

Encourage Water-Conscious Construction and Modifications with Green-Building Benefits and Credits (DWS)	New development and redevelopment present an opportunity to incorporate water-conserving infrastructure and practices. State and local government should enhance “green-building” efforts with county rebates and utility credits and state income tax credits directed specifically at water conservation.
Adopt a Public Goods Charge for Water Use (CWRM)	An across-the-board fee for water use can impart a conservation price signal, and fund the cost of water management and conservation.

Source: Water Resources and Climate Change Adaptation in Hawai'i: Adaptive Tools in the Current Law and Policy Framework, 2012

Appendix 7: Initial Public and Policy Board Meetings, 2004 - 2013

Meeting	Purpose – Major Input
11/30/2004 WAC; Central Maui and Upcountry	Initial Meeting – Intro to WUDP
9/6/2005 WAC Upcountry	Initial List of Possible Candidate Strategies
9/6/2005 WAC Central Maui	Initial List of Possible Candidate Strategies
9/12/2006 WAC Central Maui	Preliminary Screening of Candidate Strategies
9/25/2006 WAC Upcountry	Preliminary Screening of Candidate Strategies
10/8/2007 WAC Upcountry	Final Candidate Strategies
10/9/2007 WAC Central Maui	Final Candidate Strategies
12/12/2007 WAC Upcountry	Iterative Analysis and Public Review, First Round: Integrated strategies, updated characterization of resource options, conservation and raw water storage reservoir options detailed.
1/8/2008 WAC Central Maui	Iterative Analysis and Public Review, First Round: Integrated strategies, updated characterization of resource options, conservation and raw water storage reservoir options detailed.
2/13/2008 WAC Upcountry	Iterative Analysis and Public Review, Second Round: Final Candidate Strategies. Incorporate comments on first round, assumptions used in system model refined, water conservation program refined, additional options, variation and scenarios examined for each of the final candidate strategies.
6/30/2008 WAC Upcountry	Iterative Analysis and Public Review, Third Round: Economic analysis for energy costs, 50 year economic study period to account for capital-intensive resource options added, capital costs and depreciation accounting refined, water conservation program refined, strategies refined based on updated information, comments and ongoing review, additional strategy options examined.
7/23/2008 WAC Central Maui	Iterative Analysis and Public Review, Second Round: Final Candidate Strategies. Incorporate comments on first round, water conservation program refined, options and scenarios added or reconfigured, energy price scenarios presented, capital costa and depreciation accounting refined, 50 year economic study period added to account for capital-intensive resource options.
2008 Board of Water Supply	Central Maui, Iterative Analysis and Public Review, Third Round: Economic analysis presented, strategies refined, additional scenarios examined per WAC request, optimization of strategy configurations re-examined.
7/27/2009 WAC Upcountry	Iterative Analysis and Public Review, Fourth Round: Energy price scenarios presented, Wailoa Ditch base flows analyzed, and uncertainties, contingencies and project implementation timing analyzed.

Meeting	Purpose – Major Input
2009 Wailuku	Meeting referenced in BWS letter
2009 Kihei	Meeting referenced in BWS letter
4/22/2010 Board of Water Supply (4/30/2010 letter)	Final Candidate Strategies Report, 6/17/2009 • Customary and traditional uses of Kanaka Maoli relating to water, hydrological system, reforestation, stream restoration • Consistency with kuleana user rights and state law • Consultation with OHA/ DHHL • Top priorities: Protection of watersheds, stream restoration, waste water recycling • County goal to be free of reliance on fossil fuels. County help DWS identify alternative clean energy for pumping water (e.g., wind in Hali'imaile/ Upcountry district; hydro-electric in West Maui) • Small reservoirs for water capture and storage more realistic than large reservoirs (Central District) • Eminent domain to acquire all water systems is important consistent with public trust doctrine • Relation of public trust waters to food security and sustainability <u>Strategies:</u> • Northward Basal Groundwater: complex/difficult/public outreach • Eastward Basal Groundwater: consistency with Consent Decree • Na Wai `Ehā Surface Water Treatment: assignment of future uses speculative; return more water to streams and lo'i; position Waihe'e WTP on equal footing with Wai'ale WTP • Desalinization of Brackish Groundwater: expensive; toxic by-products • Extensive Conservation and Wastewater Recycling: Soundest strategy; R-1 water take into account conveyance and pumping systems; look at water allocation strategies (use/community impact)
Board of Water Supply	Central District WUDP Update, 11/16/2010. Iterative Analysis and Public Review, Fourth Round: Analysis and recommendations amended to examine recycled water options, recommendations amended to consider updated circumstances, amendments to incorporate public comment, BWS recommendations, and as approved by County Council.
8/15/2012 CWRM	Revised Project Description
9/4/2012 Council WRC	WUDP Update/Revised Project Description
9/24/2012 Board of Water Supply	WUDP Update/Schedule
1/8/2013 Public Meeting Wailuku	WUDP Update • Allocation of resources regionally • Accuracy of sustainable yields • Understanding of ground/surface water connectivity • Legal authority of WUDP to regulate growth • MIP directed growth boundaries versus need for growth

Meeting	Purpose – Major Input
	• Native Hawaiian water rights and practices • Effect of litigation on WUDP • Integrate DWS catchment systems • Relation of WUDP to infrastructure planning • Water conservation education
1/9/2013 Public Meeting Upcountry	WUDP Update • Effect of reduced ag operations on water rights • Kula is experiencing less rainfall as a trend; options • Potential for new water sources • Use of Hamakuapoko Wells • Integration of county and private systems • Catchment (cisterns)/infiltration for individuals and ag • Connect catchment to county system • Effect of drought; drought regulations • Potential use of graywater (Pulehu) • Notification of these meetings
1/10/2013 Public Meeting South Maui	WUDP Update • Disparity of MIP directed growth boundaries versus need for growth • Relation of WUDP to infrastructure planning • Balance urban versus ag during drought • DWS role as utility versus WUDP balance of all demands
1/17/2013- Public Meeting West Maui	WUDP Update • Rights of kuleana lands • Well reporting • Monitoring of water rights in forest reserves • Drought scenarios • Source of water for various private public systems (Villages at Leialii, Kahoma Subdivision)
1/22/13 Public Meeting Hāna	WUDP Update • Native Hawaiian water rights • Ha'iku Consent Decree • Effect of reduced cane production on ag water allocation • Effect of aging infrastructure on water quality <u>Upcountry Optimization Study</u> • Water conservation is a priority - Ha'iku • Quantify water conservation • Water supply – Hali'imaile • Growth rates in MIP/water as growth control tool • Pi'iholo Reservoir option • Other areas subsidize upcountry water • Connect catchment to other sources • Water rates
1/29/2014 CWRM;	Collaborative meeting – WUDP

Meeting	Purpose – Major Input
Private Water Systems; DWS	
3/12/2015 State Workshops on SWRPP	Issues that overlap with WUDP • Water rights: streamflow, mauka to makai streamflow, public trust doctrine, DHHL, kuleana, priorities, traditional and customary practices, enforce IIFS, ag water for DHHL, diversions • Aquifer recharge, SY • Water resource availability • Economic development and water resources Efficient use and management of water resources • Watersheds: protection, ag water uses, mauka protection, native ecosystems, native forests, partnerships, funding • Waste water management • Storm water capture • Drought • Surface and ground water quality • Community involvement • Aha Moku system/community associations
6/24/15	CWRM- WUDP Approach and Update
7/20/2015	Maui Alliance of Community Associations • Tensions should be addressed such as ag v. urban users, existing v. new users, DWS systems v. others, water quality v. wastewater disposal, energy costs v. distribution system, DHHL/kuleana lands, water rights/legal cases, climate change effects, etc. • Create an organic plan that can evolve. • Maui DWS: makes sense for systems to be connected, more storage needed. • Balance environmental, DNC (???) and instream uses; future ag water: prioritize good quality water for drinking. • Look all different sources and assets beyond potable water: reuse, stormwater (storage); replace high quality use water for ag; existing plantation system- protect stream water; • Water as growth control measure creates social inequities; control over water creates monopoly on development versus reasonable and beneficial use standard. • People are willing to pay more for capital projects

Appendix 8: Agricultural Use Scenarios for Kuleana Parcels by Watershed

Hydrologic Unit			Comparison Data		Kuleana Parcels		Scenario 1: Diversified Ag		Scenario 2: Wetland Taro - Consumptive Use (Low-high range water use)				Scenario 2: Wetland Taro – Streamflow (Low-high range water use)			
Unit	Name	Aquifer System	2015 Ag Baseline Crops	Pre-Contact Stream-fed Ag	Parcels near Streams	Acres	25% of acres	50% of acres	25% of acres, low	25% of acres, high	50% of acres, low	50% of acres, high	25% of acres, low	25% of acres, high	50% of acres, low	50% of acres, high
6039	Hanawana	Honopou	Pasture	Yes	Hanawana	23.271	0.020	0.040	0.087	0.233	0.175	0.465	0.582	1.745	1.164	3.491
6064	Hanawi	Keanae				0.121	0.000	0.000	0.000	0.001	0.001	0.002	0.003	0.009	0.006	0.018
6037	Hanehoi	Honopou	Pasture	Yes	Hanehoi	34.092	0.029	0.058	0.128	0.341	0.256	0.682	0.852	2.557	1.705	5.114
6078	Haneoo	Kawaipapa	Pasture, Diversified		Haneoo	102.928	0.087	0.175	0.386	1.029	0.772	2.059	2.573	7.720	5.146	15.439
6038	Hoalua	Honopou	Pasture	Yes	Hoalua	9.503	0.008	0.016	0.036	0.095	0.071	0.190	0.238	0.713	0.475	1.425
6017	Honanana	Kahakuloa	Taro, Pasture	Yes	Honanana, Kaikaina, Waihali Gl, Analua Gl	15.928	0.014	0.027	0.060	0.159	0.119	0.319	0.398	1.195	0.796	2.389
6014	Honokohau	Honokohau	Taro	Yes	Honokohau	118.865	0.101	0.202	0.446	1.189	0.891	2.377	2.972	8.915	5.943	17.830
6010	Honokowai	Honokowai			Honokowai	74.840	0.064	0.127	0.281	0.748	0.561	1.497	1.871	5.613	3.742	11.226
6084	Honolewa	Waihoi			Honolewa	1.416	0.001	0.002	0.005	0.014	0.011	0.028	0.035	0.106	0.071	0.212
6013	Honolua	Honolua		Yes	Honolua	32.647	0.028	0.056	0.122	0.326	0.245	0.653	0.816	2.449	1.632	4.897
6051	Honomanu	Waikamoi		Yes	Honomanu	14.172	0.012	0.024	0.053	0.142	0.106	0.283	0.354	1.063	0.709	2.126
6034	Honopou	Honopou	Pasture	Yes	Honopou	64.735	0.055	0.110	0.243	0.647	0.486	1.295	1.618	4.855	3.237	9.710
6035	Hoolawa	Honopou	Pasture	Yes	Hoolawa, Honokala Gl, Mokupapa Gl	57.941	0.049	0.098	0.217	0.579	0.435	1.159	1.449	4.346	2.897	8.691
6024	Iao	Waiehu	Taro, Diversified	Yes	Iao, Puulio	681.719	0.579	1.159	2.556	6.817	5.113	13.634	17.043	51.129	34.086	102.258
6018	Kahakuloa	Kahakuloa		Yes	Kahakuloa	69.161	0.059	0.118	0.259	0.692	0.519	1.383	1.729	5.187	3.458	10.374
6011	Kahana	Launiupoko			Kaopala Gl, Honokeana	47.162	0.040	0.080	0.177	0.472	0.354	0.943	1.179	3.537	2.358	7.074
6069	Kahawaiha-papa	Kuhiwa			Kahawaihapapa	1.375	0.001	0.002	0.005	0.014	0.010	0.028	0.034	0.103	0.069	0.206

Hydrologic Unit			Comparison Data		Kuleana Parcels		Scenario 1: Diversified Ag		Scenario 2: Wetland Taro - Consumptive Use (Low-high range water use)				Scenario 2: Wetland Taro – Streamflow (Low-high range water use)			
Unit	Name	Aquifer System	2015 Ag Baseline Crops	Pre-Contact Stream-fed Ag	Parcels near Streams	Acres	25% of acres	50% of acres	25% of acres, low	25% of acres, high	50% of acres, low	50% of acres, high	25% of acres, low	25% of acres, high	50% of acres, low	50% of acres, high
6008	Kahoma	Launiupoko			Kahoma	31.806	0.027	0.054	0.119	0.318	0.239	0.636	0.795	2.385	1.590	4.771
6040	Kailua	Honopou	Pasture	Yes	Kailua	3.795	0.003	0.006	0.014	0.038	0.028	0.076	0.095	0.285	0.190	0.569
6033	Kakipi	Haiku		Yes	Kakipi	34.429	0.029	0.059	0.129	0.344	0.258	0.689	0.861	2.582	1.721	5.164
6063	Kapaula	Keanae		Yes	Kapaula	7.406	0.006	0.013	0.028	0.074	0.056	0.148	0.185	0.555	0.370	1.111
6007	Kauaula	Launiupoko	Taro		Kauaula	226.561	0.193	0.385	0.850	2.266	1.699	4.531	5.664	16.992	11.328	33.984
6029	Kaupakulua	Haiku		Yes	Kaupakulua Gl	7.650	0.007	0.013	0.029	0.076	0.057	0.153	0.191	0.574	0.382	1.147
6070	Keaaiki	Kuhiwa				1.055	0.001	0.002	0.004	0.011	0.008	0.021	0.026	0.079	0.053	0.158
6046	Kolea	Waikamoi				1.170	0.001	0.002	0.004	0.012	0.009	0.023	0.029	0.088	0.059	0.176
6028	Kuiaha	Haiku		Yes	Kuiaha	90.800	0.077	0.154	0.341	0.908	0.681	1.816	2.270	6.810	4.540	13.620
6065	Makapipi	Keanae			Makapipi	12.693	0.011	0.022	0.048	0.127	0.095	0.254	0.317	0.952	0.635	1.904
6027	Maliko	Haiku		Yes	Maliko, Kanemoeala Gl	17.765	0.015	0.030	0.067	0.178	0.133	0.355	0.444	1.332	0.888	2.665
6030	Manawaiiao	Haiku		Yes	Manawaiiao, Opana, Manawai Gl	59.583	0.051	0.101	0.223	0.596	0.447	1.192	1.490	4.469	2.979	8.937
6077	Moomoonui	Kawaipapa	Pasture		Moomoonui	19.515	0.017	0.033	0.073	0.195	0.146	0.390	0.488	1.464	0.976	2.927
6041	Nailiilihaele	Waikamoi	Pasture	Yes	Nailiilihaele	34.947	0.030	0.059	0.131	0.349	0.262	0.699	0.874	2.621	1.747	5.242
6052	Nuaailua	Waikamoi		Yes	Nua'ailua	32.728	0.028	0.056	0.123	0.327	0.245	0.655	0.818	2.455	1.636	4.909
6098	Nuanuaaloa	Kipahulu			Nuanuaaloa	23.032	0.020	0.039	0.086	0.230	0.173	0.461	0.576	1.727	1.152	3.455
6089	Oheo	Kipahulu			Oheo	24.434	0.021	0.042	0.092	0.244	0.183	0.489	0.611	1.833	1.222	3.665
6005	Olowalu	Olowalu	Diversified		Olowalu, Lihau	34.648	0.029	0.059	0.130	0.346	0.260	0.693	0.866	2.599	1.732	5.197
6043	Oopuola	Waikamoi		Yes	Oopuola	12.807	0.011	0.022	0.048	0.128	0.096	0.256	0.320	0.961	0.640	1.921
6081	Papahawa-hawa	Waihoi				3.338	0.003	0.006	0.013	0.033	0.025	0.067	0.083	0.250	0.167	0.501
6053	Piinaau	Keanae		Yes	Pi`ina`au	12.908	0.011	0.022	0.048	0.129	0.097	0.258	0.323	0.968	0.645	1.936
6088	Puaaluu	Kipahulu				1.922	0.002	0.003	0.007	0.019	0.014	0.038	0.048	0.144	0.096	0.288
6042	Puehu	Waikamoi	Pasture		Puehu	16.774	0.014	0.029	0.063	0.168	0.126	0.335	0.419	1.258	0.839	2.516

Hydrologic Unit			Comparison Data		Kuleana Parcels		Scenario 1: Diversified Ag		Scenario 2: Wetland Taro - Consumptive Use (Low-high range water use)				Scenario 2: Wetland Taro – Streamflow (Low-high range water use)			
Unit	Name	Aquifer System	2015 Ag Baseline Crops	Pre-Contact Stream-fed Ag	Parcels near Streams	Acres	25% of acres	50% of acres	25% of acres, low	25% of acres, high	50% of acres, low	50% of acres, high	25% of acres, low	25% of acres, high	50% of acres, low	50% of acres, high
6050	Punalau	Waikamoi			Punalau	8.723	0.007	0.015	0.033	0.087	0.065	0.174	0.218	0.654	0.436	1.309
6031	Uaoa	Haiku		Yes	Uaoa	13.164	0.011	0.022	0.049	0.132	0.099	0.263	0.329	0.987	0.658	1.975
6004	Ukumehame	Ukumehame			Ukumehame, Puu Kauoha, Mopua	111.675	0.095	0.190	0.419	1.117	0.838	2.233	2.792	8.376	5.584	16.751
6009	Wahikuli	Honokowai				1.560	0.001	0.003	0.006	0.016	0.012	0.031	0.039	0.117	0.078	0.234
6062	Waiaaka	Keanae				3.674	0.003	0.006	0.014	0.037	0.028	0.073	0.092	0.276	0.184	0.551
6023	Waiehu	Waiehu		Yes	Waiehu, Kalaeliili, Kalepa Gulch	669.985	0.569	1.139	2.512	6.700	5.025	13.400	16.750	50.249	33.499	100.498
6022	Waihee	Waihee	Taro, Diversified	Yes	Waihee	137.295	0.117	0.233	0.515	1.373	1.030	2.746	3.432	10.297	6.865	20.594
6047	Waikamoi	Waikamoi				2.251	0.002	0.004	0.008	0.023	0.017	0.045	0.056	0.169	0.113	0.338
6001	Waikapu	Waikapu	Taro, Diversified	Yes	Waikapu	170.852	0.145	0.290	0.641	1.709	1.281	3.417	4.271	12.814	8.543	25.628
6083	Wailua	Waihoi			Wailua	12.626	0.011	0.021	0.047	0.126	0.095	0.253	0.316	0.947	0.631	1.894
6056	Wailuanui	Keanae	Taro, Pasture	Yes	Wailuanui	66.734	0.057	0.113	0.250	0.667	0.501	1.335	1.668	5.005	3.337	10.010
6080	Waiohonu	Waihoi			Waiohonu, Pukuilua Gl	16.089	0.014	0.027	0.060	0.161	0.121	0.322	0.402	1.207	0.804	2.413
6055	Waiokamilo	Keanae			Waiokamilo	0.544	0.000	0.001	0.002	0.005	0.004	0.011	0.014	0.041	0.027	0.082
6036	Waipio	Honopou	Pasture	Yes	Waipio, Waipionui	16.822	0.014	0.029	0.063	0.168	0.126	0.336	0.421	1.262	0.841	2.523
Total						3293.635	2.800	5.599	12.351	32.936	24.702	65.873	82.341	247.023	164.682	494.045

Kuleana parcels: OHA data, 2009. MDWS: Interpretation of location of kuleana parcels by watershed and stream association

Scenarios- 25% or 50% of kuleana acreage per crop; diversified ag- 3400 gpd/ac; taro consumptive use- 15000 (low) - 40000 (high) mgd; taro streamflow- 100,000 (low) - 300,000 (high) mgd

2015 Ag Baseline: crops intersecting one or more kuleana parcels; The Nature Conservancy data: Predicted Pre-Contact Irrigated Ag (1 Stream or 3 Rain+Stream) intersecting with one or more Kuleana Parcels

Appendix 9: Ka Pa'akai Analysis Research List

- Beckwith, Martha. Hawaiian Mythology. The University Press of Hawai`i, Honolulu, 1970.

- Cooper, George, and Gavan Daws. *Land and Power in Hawai`i: The Democratic Years*. Honolulu: University of Hawai`i Press, 1985. Paperback ed., 1990

- I`i, John Papa. *Fragments of Hawaiian History.* B.P. Bishop Museum Press: Honolulu, 1959.

- Kamakau, Samuel M. *Ruling Chiefs of Hawai`i.* The Kamehameha Schools Press: Honolulu (2 vols.), 1961.

- Kamakau, Samuel Manaiakalani. *The Works of the People of Old: Na Hana a ka Po`e Kahiko*. Translated from the newspaper Ke Au okoa by Mary Kawena Pukui; arranged and edited by Dorothy B. Barrere. [Honolulu]: Bishop Museum Press, 1976.

- Kame`eleihiwa, Lilikala. *Native Land and Foreign Desires,* Honolulu: Bishop Museum Press, 1992.

- Kawa`a, Luana, *Cultural Survey & Ahupua`a Inventory: Ahupua`a of Waiehu & Waihe`e, Island of Maui*, Ka Piko O Ka Na`auao (The Hawaiian Learning Center), 2009.

- Kawa`a, Luana, *Cultural Survey & Moku Inventory: Moku of Kipahulu and Hana, Island of Maui* (Draft),Ka Piko O Ka Na`auao (The Hawaiian Learning Center), 2009.

- Kawa`a, Luana, *Cultural Survey & Moku Inventory: Moku of Honua`ula & Kula, Island of Maui* (Draft),Ka Piko O Ka Na`auao (The Hawaiian Learning Center), 2009.

- Kawa`a, Luana, *Cultural Survey of the Moku of Maui: Na Wai Eha (Waikapu, Wailuku, Wailuku, Waiehu, Waihe`e) Kula, Honua`ula, Kahikinui, Kaupo, Kipahulu, and Hana, Volumes 1-4,* Ka Piko O Ka Na`auao (The Hawaiian Learning Center), 2009.

- Kawa`a, Luana, *Summary Report of Translated Land Documents: General Overview of Traditional Ahupua`a System,* Ka Piko O Ka Na`auao (The Hawaiian Learning Center), 2009.

- Kawa`a, Luana, *Cultural Survey & Ahupua`a Inventory: Ahupua`a of Waikapu & Wailuku, Island of Maui,* (Draft) Ka Piko O Ka Na`auao (The Hawaiian Learning Center), 2009.

- Kawa`a, Luana, *Cultural Survey & Moku Inventory: Moku of Honua`ula & Kula, Island of Maui* Ka Piko O Ka Na`auao (The Hawaiian Learning Center), 2009.

- Ladefoged, T.N., et al., *Opportunities and constraints for intensive agriculture in the Hawaiian archipelago prior to European contact*, J. Archaeol. Sci. (2009), doi:10.1016/j.jas.2009.06.030

- Malo, David. *Hawaiian Antiquities*. Bishop Museum Press, Honolulu, 1959.

- Matsuoka, Jon K. *Native Hawaiian Ethnographic Study For the Hawai`i Geothermal Project Proposed for Puna and Southeast Maui*. Oak Ridge; Oak Ridge National Laboratory.

- Pukui, Mary K., Samuel H. Elbert, and Esther T. Mookini. *Place Names of Hawai`i*. The University Press of Hawai`i: Honolulu, 1976.

- Sterling, Elspeth P. *Sites of Maui.* Bishop Museum Press, 1997.

- County of Maui, Planning Department. *General Plan, Maui Island Plan, Community Plans.*

- *CWRM Findings of Fact, Conclusions of Law, and Decision and Orders – Na Wai `Eha and East Maui Streams*, and related documents.

- CWRM, *Hawai`i Water Plan*, as amended.

- Department of Hawaiian Home Lands (DHHL), *Maui Island Plan* and *Regional Plans*.

- Environmental Council, State of Hawai`i (1997). *Guidelines for Assessing Cultural Impacts*.
- Forman, David M., Susan K. Serrano. *Ho`ohana Aku, a Ho`ola Aku: A legal primer for Traditional and Customary Rights in Hawai`i,* 2012.

- *Interim Instream Flow Standards (IIFS) adopted for both East and West Maui Streams*, 1988, (Sections 13-169-44 and 48, Hawai`i Administrative Rules. According to Section 13-169-46, Hawai`i Administrative Rules).

- *Ko`olau Poko Watershed Management Plan.* Honolulu Board of Water Supply, 2012.

- Miike, Lawrence. *Water and the Law in Hawai`i.* University of Hawai`i Press, 2004.

- *Native Hawaiian Rights Handbook*. Edited by Melody Kapilialoha MacKenzie. Honolulu: Native Hawaiian Legal Corporation; Office of Hawaiian Affairs. Distributed by University of Hawai`i Press, 1991.

- *Native Hawaiian Access Rights Project Phase III. Recommendations for SMA Rules and Process.* A Publication of the Hawai`i Coastal Zone Management Program, Office of Planning Department of BEDT State of Hawai`I, Final Report December 15, 2002.

- Sproat, D. Kapuaala, Ola I Ka Wai: *A legal Primer for Water Use and Management in Hawai`i.* Ka Huli Ao Center for Excellence in Native Hawaiian Law, William S. Richardson School of Law*, 2014.*

- Department of Land and Natural Resources, State of Hawai`i. *The Rain Follows The Forest Hahai no ka ua i ka ululā`au, A Plan to Replenish Hawaii`s Source of Water*, November 2011.

- CWRM. *Hawai`i Stream Assessment*, Report R84, December 1990.

Appendix 10: Generalized Assessment of Impacts of Preliminary Measures and Strategies on Traditional and Customary Practices of Native Hawaiians

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
WATERSHED AND AQUIFER PROTECTION			
1. Invasive alien plant control, ungulate (pigs, deer, etc.) control (fencing, etc.), reforestation. Implement via watershed partnership programs (DWS supports and funds programs. Leveraging state and private funding. Invasive plants and animals and ungulates disturb watershed resources and functions by displacing or removing native plants and animals, disturbing the soil, increasing runoff and sediment, and decreasing aquifer recharge potential)	Native Hawaiian rights include gathering (PASH): 1) invasive Polynesian canoe plants and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; 2) introduced and native animals used for food and cultural practices; and 3) native Hawaiian trees, ferns, flowers, bark, branches, vines and fruit.	1) Native Hawaiian gathering rights (PASH) are impacted by: 1) Eradicating or reducing invasive Polynesian canoe plants (kukui nut tree for example) and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; 2) Eradicating or reducing introduced animals used for food and cultural practices; and 3) fencing, which limits or prohibits native Hawaiian cultural practitioners from accessing areas to hunt and gather cultural resources, including stones (pohaku), and native and introduced plants and animals used for food and cultural practices. 2) Native plant and tree reforestation enhances natural ecosystem health and increases underground fog drip flows, which helps support thriving native Hawaiian ecosystems from forests to reefs, thereby providing	1) Per PASH court decision, native Hawaiians should be allowed gathering and access rights in areas where cultural resources exist. Incorporate gathering access points into watershed fencing. 2) Fencing should be installed in remote areas inaccessible to hunters. This typically applies to higher elevation fencing above 3,000 feet but is not as easy to accomplish in the lower elevations. 3) Obtain input from individuals and groups familiar with the areas fences are to be constructed. 4) Fences and access points need to have signs posted that warn hunters that active feral ungulate animal control is in progress and that the area may

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
		more abundant resources for native Hawaiian cultural practitioners. Based on discussions with East Maui residents in the EIS planning phase of the East Maui Watershed Fenceline, fences above the 3,000 foot elevation are unlikely to be encountered due to the fact animals are caught well before anyone needs to traverse higher up the mountain.	be hazardous to dogs due to the control methods being employed, i.e. the use of tools and methods that may be fatal to pets and hunting dogs. 5) State land above constructed fences in the forest reserves should have signage that indicates it remains classified as "public hunting," and hunters should still be permitted to enter the areas for subsistence purposes. 6) Watershed programs and watershed plan development should incorporate advisors with expertise in native Hawaiian cultural practices. 7) Support conservation land trusts, nonprofit organizations that undertake or assist in land or conservation easement acquisition or stewardship of land or easements. 8) Strategy 2, expanding watershed protection to lower elevations could foster productive environments to

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
			produce more cultural resources at lower elevations. 9) Strategy 3, ahupua`a management, if it creates more connectivity and includes native Hawaiian access rights. Strategy 5, native Hawaiian consultations, are an opportunity to address gathering and use access.
2. Expand watershed protection to lower elevations (Programs now focus on higher elevations (3000+)	1) Native Hawaiian rights include gathering (PASH) - See Footnote 1. 2) Increased access to hunters may help control feral ungulate damage in the lowland native forests.	1) Expanding watershed protection to lower elevations could foster productive environments to produce more of the resources available at higher elevations. 2) Expands invasive alien plant and ungulate control conflicts stated in Strategy 1 to lower elevations. 3) Expands reforestation benefits and potential conflicts in Strategy 1 to lower elevations.	Same as Strategy 1 mitigations, applied to lower elevations.
3. Ahupua'a watershed-based planning and management approach (Ridge to ocean approach focused on stream systems)	Native Hawaiian rights include gathering (PASH) - See Footnote 1.	No adverse impacts. Ahupua`a management creates more connectivity. Strategy supports PASH court decision.	No mitigation necessary. Indigenous resource management practices should be integrated with western management practices in each moku. Strategy can be strengthened by: 1) Support conservation land trusts, nonprofit organizations

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
			that undertake or assist in land or conservation easement acquisition or stewardship of land or easements.
4. Consultation with Native Hawaiian community and local experts on resource management (Water representative of each moku, advisory role and partnership)	Native Hawaiian rights include gathering (PASH) - See Footnote 1.	1) Due diligence consultation with native Hawaiian communities and expertise should have a positive impact upon the access to and management of natural resources used by cultural practitioners. 2) Competing resource utilization could occur as a result of expanding access to more practitioners, as a result of actions resulting from consultation.	No mitigation necessary. The consultation process should ensure diverse, holistic, and comprehensive consultation with the larger native Hawaiian community in addition to the aha mokus.
5. Scientific studies to support decision making (Study hydrogeologic and ecological conditions; increased monitoring)	Native Hawaiian rights impacted by ground or surface water use.	Improved understanding of ground and water resource benefits resource management and potentially improves understanding of impacts on native uses.	No mitigation necessary.
6. Use drought conditions as baseline to evaluate water supply and effects of water use (Determine projections to use; may vary geographically.)	1) Auwai systems that travel great distances from the stream and do not return water to the stream. 2) Native Hawaiian rights impacted by ground or surface	No adverse impacts. 1) Using drought conditions as a baseline would be more protective over use of average conditions as presently occurs. Long-term hydrologic drought could impact sustainable yield of groundwater which is interconnected with surface water resources.	No mitigation necessary.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
	water use during drought conditions.	2) If drought conditions were used as a baseline for IIFS or sustainable yield, if drought conditions do not supply sufficient flow to auwai's, if restrictions limit auwai use, or if certain auwai systems are deemed "non- instream uses," kalo growers and other native Hawaiian cultural crops could be impacted.	
7. Quantify the impact of watershed management on groundwater recharge and distribute funding proportionally (Prioritize efforts by impact, expand funding from private purveyors, state and other beneficiaries.)	Native Hawaiian rights include gathering (PASH) - See Footnote 1.	No adverse impacts. Quantifying the impact of groundwater recharge, which relates to base streamflow, can assist in monitoring whether programs that support healthy watershed conditions and accordingly cultural practices are beneficial.	No mitigation necessary.
8. Improved ground and surface water resources and diversion monitoring by CWRM	--	No adverse impacts. Improved monitoring supports effective protection of resources.	No mitigation necessary.
9. Restrict land uses with high risk of well contamination near drinking water wells (Proposed Wellhead Protection ordinance based on the capture zone of well)	Traditional animal husbandry such as keeping pigs and goats.	Locations with traditional animal husbandry could be impacted by their proximity to groundwater resources and restrictions implemented to protect drinking water wells. http://co.maui.hi.us/222/Wellhead-Protection	1) Ensure regulations do not prohibit non-commercial operations consistent with traditional and customary native Hawaiian rights. Allow

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
			limited numbers of animals in close proximity to wells.[2]
10. Protect and recharge ground water during non-drought periods to stabilize supply (Reduce pumping- increased surface water use after public trust uses are met, aggressive conservation and alternative sources)	Kuleana farmers dependent on auwai's and diversions grow kalo and other plants used by cultural practitioners.	Protection of groundwater resources which contributes to base streamflow is beneficial. Potential secondary impacts may occur relating to increased surface water use after public trust uses are met (Strategy 13).	1) Strategy 8, improved CWRM monitoring.
11. No new stream diversions for non-instream uses until interim flow standards are adopted. (Could extend to no new diversion or increased diversion)	Kuleana farmers dependent on auwai's and diversions grow kalo and other plants used by cultural practitioners. Auwai systems that travel great distances from the stream and do not return water to the stream.	No adverse impacts. Areas and resources used to gather will be expanded and return of base streamflow will facilitate native Hawaiian cultural practitioners by supporting a thriving native ecosystem that supports cultural practices with its abundance of resources produced.	No mitigation necessary.
12. Stream restoration- municipal and agricultural water returned to stream (Decrease municipal and agricultural use of streams)	1) Native Hawaiian gathering rights (PASH) - See Footnote 1. 2) Agricultural water users who receive surface water and grow crops such as Polynesian canoe	No adverse impacts. The intent of this strategy is to reduce diversion by large ag users and municipal users during low flow conditions.	No mitigation necessary.

[2] Within the proposed regulated areas, the proposed Wellhead Protection Ordinance would allow the following located more than 50 feet from wells or well fields that supply public water systems: a lot or facility (other than an aquatic animal production facility) where animals will be stabled or confined and fed or maintained for a total of 45 days or more in any 12 month period, and where crops, vegetation forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility (excludes pasture).

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
	plants, non-native plant species, and native plants used by cultural practitioners.	1) Native Hawaiian gathering rights (PASH) are positively impacted by increased stream flows due to enhancing instream growth of: 1) invasive Polynesian canoe plants and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; 2) introduced animals used for food and cultural practices; and 3) native and introduced plants and animals used for food and cultural practices. 2) Return of base streamflow generally facilitates native and non-native plant and animal life within the stream, thereby providing more abundant resources for native Hawaiian cultural practitioners. 3) Cultural practioners and resources along long-diverted streams may be affected by potential flooding associated with removal of diversions 4) If base flows are returned to the streams and restrictions are placed upon lo`i kalo waters that are	

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
		returned to the stream after use (i.e. not geographically removed due to auwai systems separated by distances from the stream); cultural practitioners may be affected. Alternatively, water pipes can be used to return water to the streams for those practitioners whose auwai systems move water significant distances from the stream. 5) As the strategy is intended, cultural practitioners located in areas such as the Kula Agricultural Park that receive untreated agricultural water would not be negatively impacted.	
CONVENTIONAL WATER SOURCE DEVELOPMENT			
13. Increase use of surface water for municipal needs during wet season when all public trust uses are satisfied, including kuleana and traditional and cultural users. (Expand treatment facilities and obtain reservoirs. Permitting and dam liability issues.)	Agricultural water users who receive treated water through surface water sources and grow crops such as Polynesian canoe plants, native plants and non-native plant species used by cultural practitioners.	1) The measure proposes to use surface water *in excess* of the base flow necessary for kuleana and public trust uses and should therefore *not* impact native Hawaiian agricultural and traditional and customary uses. 2) The measure may reduce water flowing to the ocean during the wet season, thereby affecting nearshore	1) Consider potential effects to nearshore ecosystems for areas potentially affected by reduced stream water prior to increased diversion. 2) Strategy 8, improved CWRM monitoring.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
		ecosystems and cultural resources.	
14. When IFS adopted protecting kuleana and instream uses, then support water transport for diversified ("sustainable") agriculture (Support diversified ag economy with low cost untreated source)	Diversified agriculture farming.	No adverse impacts. This is a policy statement indicating a priority for water transport for diversified ag over other nonpublic trust uses. Supports availability of water for Native Hawaiian diversified farming; provide low cost untreated source reducing dependence on potable water in some areas.	No mitigation necessary.
15. Increase county oversight of well drilling in non-designated groundwater management areas (Holistic review including water quality, quantity and land use impact addressed before well construction permit issued)	Kuleana and cultural uses in East Maui, Na Wai `Eha and West Maui.	The intent of this strategy is to increase the meaningful evaluation of and opportunity for input on wells in non-designated areas. It was suggested at community meetings that an early process led by the County could assist in addressing the problem. CWRM well and pump permits are required for all wells, with notice provided on the CWRM website; any party may request to be placed on the notification list. 1) Wells may adversely affect spring and other well water availability and quality. 2) Kuleana and cultural users reliant upon streams could be negatively affected by reduced base flows feeding streams and springs due to	This strategy should be redefined. Encourage CWRM to increase analysis of well permits, including spatial distribution and evaluation of well impacts on quantity and quality of nearby water resources. Amendment to state law may be required to grant the County authority to undertake a large role in the well permit process.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
		nearby wells with hydrogeological connections.	
16. Manage well development and operations to reduce seawater intrusion and chlorides	Native Hawaiian stream users.	No adverse impacts. Increased reliance on well water could translate into decreased reliance on surface water, positively impacting Native Hawaiian rights and resources.	No mitigation necessary.
17. Ha`iku aquifer well development (Potential resource/medium-term; within sustainable yield. For regional use and transport to growth areas.)	Kuleana and cultural uses in East Maui.	Increased ground water withdrawal potentially affecting streams and near shore ecosystems.	Ha`iku aquifer: Maintain buffer to sustainable yield pending IFS and USGS studies of the interaction between ground and surface water and potential impact from pumpage on stream flows. <u>All well development:</u> 1) Strategy 15, increase oversight of well distribution in non-designated groundwater management areas. 2) Strategy 5, scientific studies. 3) Strategy 8, improved CWRM monitoring. 4) Strategy 10, protect and recharge ground water during non-drought periods to stabilize supply. 5) Strategy 16, manage well development and operations to reduce seawater intrusion and chlorides.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
			6) Strategies 38-60, alternative water sources, conservation to reduce source development needs.
18. Makawao aquifer basal well development at 1500 ft + elevation for growth and backup regionally (Aquifer not well studied. High elevation pumping costs)	No perennial streams west of Maliko; no known kuleana uses. Potential gathering and cultural uses.	1) Regional use of basal groundwater. 2) Reduction of transport from water abundant to dryer areas would maintain more water in the streams of wet areas which supports Native Hawaiian cultural and kuleana users who depend on surface water.	Same as all well development mitigation for Measure 17.
19. Waikapu Aquifer basal well development (Private wells drilled for available sustainable yield)	Kuleana and cultural uses in Na Wai `Eha.	1) Increased ground water withdrawal potentially affecting streams and near shore ecosystems. 2) Reduction of transport from water abundant to dryer areas would maintain more water in the streams of wet areas which supports Native Hawaiian cultural and kuleana users who depend on surface water.	Same as all well development mitigation for Measure 17.
20. Waihe`e Aquifer basal well development  (High capital cost, smaller wells for limited yield of N Waihe`e per USGS study)	Kuleana and cultural uses in Na Wai `Eha.	1) Increased ground water withdrawal potentially affecting streams and near shore ecosystems. 2) Reduction of transport from water abundant to dryer areas would maintain more water in the	Same as all well development mitigation for Measure 17.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
		streams of wet areas which supports Native Hawaiian cultural and kuleana users who depend on surface water.	
21. High level well development (within sustainable yield) (Avoid transport between aquifer units)	Kuleana and cultural uses in East Maui and Na Wai `Eha.	Kuleana and cultural users of streams could be affected by reduced base flows primarily fed by high level water.	Same as all well development mitigation for Measure 17.
22. Honopou, Waikamoi, Ke`anae basal well development (Extend transmission for medium elevation well development. Aquifers not studied, sustainable yield likely to be adjusted down)	Kuleana and Native Hawaiian cultural uses in East Maui.	Increased ground water withdrawal potentially affecting streams and nearshore ecosystems.	Same as all well development mitigation for Measure 17.
23. Kamaole Aquifer, basal well development (Brackish wells for non-potable uses for new development. Dual or private systems Brackish quality appropriate for irrigation, desal and other nonpotable uses. Reported pumpage incomplete to assess available sustainable yield)	Nearshore native Hawaiian cultural practitioners' resources.	Nearshore ecosystem could be affected by a potential reduction in freshwater mixing with seawater.	Same as all well development mitigation for Measure 17.
24. Honokowai aquifer well development (within sustainable yield)	Kuleana and cultural uses in West Maui.	1) Increased ground water withdrawal potentially affecting streams and nearshore ecosystems.	Same as all well development mitigation for Measure 17.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
(Avoid transport between aquifer units; Honokowai may be close to sustainable yield)		2) Reduction of transport from water abundant to dryer areas would maintain more water in the streams of wet areas which supports Native Hawaiian cultural and kuleana users who depend on surface water.	
25. Honolua aquifer well development (within sustainable yield) (Transmission to growth area within aquifer sector; optimize well/aquifer management)	Kuleana and cultural uses in West Maui.	1) Increased groundwater withdrawal potentially affecting streams and nearshore ecosystems. 2) Reduction of transport from water abundant to dryer areas would maintain more water in the streams of wet areas which supports Native Hawaiian cultural and kuleana users who depend on surface water.	Same as all well development mitigation for Measure 17.
26. Launiupoko aquifer wells development (within sustainable yield) (Reduce demand on Honokowai aquifer- optimize well/aquifer management)	Kuleana and cultural uses in West Maui.	Increased ground water withdrawal potentially affecting streams and nearshore ecosystems.	Same as all well development mitigation for Measure 17.
27. Add raw surface water storage at Kamole, Olinda or Pi'iholo Water Treatment Facilities	1) Kuleana and native Hawaiian cultural uses due to continued diversions.	1) Kuleana and native Hawaiian cultural uses could be enhanced by reducing diversion and enhancing	1) Strategy 10, protect and recharge ground water during non-drought periods to stabilize supply.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
(IFS, EMI diversion permits, EMI contract, land and critical watershed issues)	2) Native Hawaiian rights including gathering (PASH) - See Footnote 1.	continuous streamflow due to increased storage capabilities. 2) Native Hawaiian gathering rights (PASH) are impacted by reduced instream abundance of cultural resources: 1) Polynesian canoe plants and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; and 2) native and introduced plants and animals used for food and cultural practices.	2) Strategy 11, no new or increased stream diversions on East Maui streams for non-instream uses until interim flow standards are adopted. 3) Strategy 14, when IFS adopted, protecting kuleana and instream uses, support water transport for diversified ("sustainable") agriculture.
28. Increase capacity at 'Iao Water Treatment Facility for wet season use (Appurtenant rights, water use permits)	1) Kuleana and native Hawaiian cultural uses due to continued diversion. 2) Native Hawaiian rights including gathering (PASH) - See Footnote 1.	Native Hawaiian gathering rights (PASH) are impacted by reduced instream abundance of cultural resources: 1) Polynesian canoe plants and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; and 2) native and introduced plants and animals used for food and cultural practices.	Same as mitigation for Measure 28.
29. Increase capacity at Kamole Water Treatment Facility for wet season use (Flow characteristics of Wailoa Ditch and intake structure configuration,	1) Kuleana and native Hawaiian cultural uses due to continued diversion. 2) Native Hawaiian rights including gathering (PASH) - See Footnote 1.	Native Hawaiian gathering rights (PASH) are impacted by reduced instream abundance of cultural resources: 1) Polynesian canoe plants and other invasive non-native plant species used by cultural practitioners	Same as mitigation for Measure 28.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
IFS, EMI diversion permits, EMI contract)		including trees, ferns, flowers, bark, branches, vines and fruit; and 2) native and introduced plants and animals used for food and cultural practices.	
30. Connect Kamole WTF to Central Maui System	1) Kuleana and native Hawaiian cultural uses due to continued diversion. 2) Native Hawaiian rights including gathering (PASH) - See Footnote 1.	Native Hawaiian gathering rights (PASH) are impacted by reduced instream abundance of cultural resources: 1) Polynesian canoe plants and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; and 2) native and introduced plants and animals used for food and cultural practices.	Same as mitigation for Measure 28.
31. Expand Mahinahina WTF (Obtain MLP reservoirs; upfront costs)	1) Kuleana and native Hawaiian cultural uses due to continued diversion. 2) Native Hawaiian rights including gathering (PASH) - See Footnote 1.	Native Hawaiian gathering rights (PASH) are impacted by reduced instream abundance of cultural resources: 1) Polynesian canoe plants and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; and 2) native and introduced plants and animals used for food and cultural practices.	Same as mitigation for Measure 28.
INCREASE WATER SYSTEM RELIABILITY & FLEXIBILITY			
32. Develop and maintain back-up wells even if more expensive	Kuleana and cultural uses in East Maui and Na Wai `Eha.	No adverse impacts. Kuleana and cultural uses in East Maui and Na Wai `Eha could be enhanced by others'	Same as mitigation for Measure 17.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
(Drought, equipment failure, chlorides or other source or supply problems. Avoid use restrictions)		reduction in dependence on surface water use.	
33. Develop wells for increased reliable source Upcountry (reduce surface water transport) (Drought, equipment failure, chlorides or other source or supply problems. Avoid use restrictions and mitigate stream use in dry season)	East Maui Native Hawaiian cultural practitioners' resources.	Potential decreased use of surface water resulting in less transport.	Same as mitigation for Measure 17.
34. Diversify to the most cost-effective combination of groundwater, surface water, and aggressive conservation (Policy statement. Some temporary cutbacks acceptable in situations of drought/equipment failure)	Kuleana and cultural uses in East Maui and Na Wai `Eha.	Kuleana and cultural uses in East Maui and Na Wai `Eha could be affected if surface water is deemed more cost-effective and is not returned to the streams.	Same as mitigation for Measure 17.
35. Require private public systems to develop in a manner facilitating potential interconnection with Maui DWS systems or integrated management (Amend County Code; increase costs of private systems)	---	No adverse impacts. Policy statement.	No mitigation necessary.
36. Increase connection between Maui DWS subdistricts	Kuleana and cultural uses in East and West Maui and Na Wai `Eha.	1) Increased connection which facilitates development may result	1) Strategy 11, no new or increased stream diversions for

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
		in increased use of water resources, including surface water, affecting kuleana and cultural uses. 2) Increased connection which improves efficiency of use may result in decreased use of water resources.	non-instream uses until interim flow standards are adopted. 2) Strategy 13, increase use of surface water for municipal needs during wet season when all public trust uses are satisfied, including kuleana and traditional and cultural users.
37. Expand capacity of Water Treatment Plants for seasonal use	Kuleana and cultural uses in East and West Maui and Na Wai `Eha.	Kuleana and cultural uses could be affected if surface water use increases.	1) Strategy 11, no new or increased stream diversions for non-instream uses until interim flow standards are adopted. 2) Strategy 13, increase use of surface water for municipal needs during wet season when all public trust uses are satisfied, including kuleana and traditional and cultural users.
INCREASE ALTERNATIVE RESOURCES			
38. Maximize R-1 reclaimed wastewater system capacity and use (Limited supply, relatively high cost, less reliable. Minimize underground injection)	Nearshore native Hawaiian cultural practitioners' resources.	More R-1 production could decrease use of surface water, but use of injection wells may potentially increase pollution impacts to nearshore water resources of native Hawaiian cultural practitioners. Increasing the use of R-1 water, rather than injection, should reduce impacts.	1) Obtain and conform to NPDES permit requirements addressing discharges (injection). 2) Offset injection by maximizing beneficial use of excess recycled water (e.g., expand use requirements, land

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
			application, potential to treat to drinking water standards, etc.).
39. Expand requirement for commercial properties within 100 feet of reclaimed water system to connect and use R-1 water for landscape irrigation (Amend Maui County Code, Chapter 20.30- requires connection within 100 feet)	Nearshore native Hawaiian cultural practitioners' resources.	More R-1 production and use could decrease use of surface water, but use of injection wells may potentially increase pollution impacts to nearshore water resources of native Hawaiian cultural practitioners. Expanding requirements for use of R-1 water will reduce injection.	1) Obtain and conform to NPDES permit requirements addressing discharges (related to injection). 2) In addition to increasing use requirements, offset injection by maximizing beneficial use of excess recycled water (e.g., land application, potential to treat to drinking water standards, etc.).
40. Expand R-2 Kahului Wastewater Treatment Facility distribution and/or upgrade to R-1 (Upgrade to R-1 needed, limited service areas)	Nearshore native Hawaiian cultural practitioners' resources.	More recycled water production and use could decrease use of surface water on Central isthmus, but use of injection wells may potentially increase pollution impacts to nearshore water resources of native Hawaiian cultural practitioners.	Same as mitigation for Strategy 38.
41. Expand R-1 system from Kihei Wastewater Treatment Facility (Committed service connections in dry season use leaves 0.7 mgd unused capacity. Restricted nonpotable uses)	Nearshore native Hawaiian cultural practitioners' resources.	More R-1 production and use could decrease use of surface water, but use of injection wells may potentially increase pollution impacts to nearshore water resources of native Hawaiian cultural practitioners.	Same as mitigation for Strategy 38.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
42. Implement R-1 expansion from Mahinahina Wastewater Treatment Facility (Offset potable water use)	Nearshore native Hawaiian cultural practitioners' resources.	More R-1 production and use could decrease use of surface water, but use of injection wells may potentially increase pollution impacts to nearshore water resources of native Hawaiian cultural practitioners.	Same as mitigation for Strategy 38.
43. Program to use small greywater systems for small residential/commercial (Amend State and possibly County regulations)	--	No adverse impacts. Positive impacts may occur if resulting in reduced ground and surface water use and transport.	No mitigation necessary.
44. Incentives for residential/small commercial catchment systems (Roof, tank, underground storage systems can be used for landscape water use. Water quality issues)	--	No adverse impacts. Positive impacts may occur if resulting in reduced ground and surface water use and transport.	No mitigation necessary.
45. Low impact project design for onsite water retention (Permeable surfaces, etc. Amend County code. Cost effective)	--	No adverse impacts. Positive impacts may occur if resulting in reduced ground and surface water use and transport.	No mitigation necessary.
46. Desalination of brackish or sea water for agricultural irrigation (Energy costs. Disposal of brine)	Kuleana and cultural uses in East and West Maui and Na Wai `Eha.	1) Potential pollution impacts from brine disposal to nearshore water resources of native Hawaiian cultural practitioners. 2) Positive impacts may occur if kuleana and cultural uses have	Obtain and conform to NPDES permit requirements addressing discharges (brine).

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
		access to more water due to decreased surface water use and reduced transport of surface water.	
47. Maintain/manage plantation ditch systems for continued potable and non-potable water conveyance (Invest in existing systems, resolve ownership, management issues)	Kuleana and cultural uses in East and West Maui and Na Wai `Eha.	1) Continued use of ditch systems perpetuates transport of surface water (and limited groundwater). 2) Continued use of ditch systems facilitates conveyance to some to kuleana and cultural uses.	1) Strategy 11, no new or increased stream diversions for non-instream uses until interim flow standards are adopted. 2) Strategy 13, increase use of surface water for municipal needs during wet season when all public trust uses are satisfied, including kuleana and traditional and cultural users.
48. Stormwater reuse (Capture flash supply as raw water storage for treatment or utilize reservoirs to store irrigation supply for diverse ag)	Kuleana and cultural uses in East and West Maui and Na Wai `Eha.	1) Positive impacts may occur if kuleana and cultural uses have access to more water due to decreased surface water use and reduced transport of surface water. 2) Reductions in nonpoint flow to the ocean serving nearshore resources would be mitigated by capturing only 'flash' stormwater.	Ensure capture limited to flash supply without impacts to streamflow or nearshore resources.
INCREASE CONSERVATION			
49. WaterSense (water efficiency) standard for new development and existing retrofits (Amend County code. 20%-30% more water efficient than standard)	Kuleana and cultural uses in East Maui and Na Wai `Eha, and West Maui.	No adverse impacts. Kuleana and cultural uses could be enhanced by a reduction in dependence on surface water use through conservation.	No mitigation necessary.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
50. Retrofit programs for existing development (Rebate, retrofit, give-away programs for residential and small commercial uses)	Kuleana and cultural uses in East Maui and Na Wai `Eha, and West Maui.	No adverse impacts. Kuleana and cultural uses could be enhanced by a reduction in dependence on surface water use through conservation.	No mitigation necessary.
51. Outdoor water wasting and use controls (Amend County code, disallow overspray, washing without hose nozzle, etc.)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Kuleana and cultural uses could be enhanced by a reduction in dependence on surface water use through conservation.	No mitigation necessary.
52. Water conserving landscape requirements for resorts, golf courses, public facilities (Amend County code to set standard)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. 1) Kuleana and cultural uses in could be enhanced by a reduction in dependence on surface water use through conservation. 2) Nearshore water cultural resources may benefit from better water/nutrient management practices.	No mitigation necessary.
53. Incentive programs to convert existing landscape to water conserving (Turf removal programs for example)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.
54. Require climate adapted plants for large new developments	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.

Preliminary Measures and Strategies	Extent to which traditional and customary native Hawaiian rights are exercised in the area which may be affected	Extent to which those resources and rights will be affected or impaired by the proposed measure	Feasible action to be taken to reasonably protect native Hawaiian cultural resources if they are found to exist.
55. Require aggressive conservation in new development in all areas (Craft program to carry out policy)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.
56. More aggressive landscape water conservation measures in dry areas than wet areas (Some standards or programs vary geographically)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.
57. Pursue a policy of aggressive water conservation at all times (not just during drought) (Craft program to carry out policy)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.
58. Use water rates as means to encourage conservation (Tiered pricing can have this effect; equity is an issue)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.
59. Surface water efficiency programs (Improvements to diversions, conveyances, storage, meters to reduce loss)	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.
60. Reduce water loss of potable and nonpotable systems	Kuleana and cultural uses in East Maui and Na Wai Eha, and West Maui.	No adverse impacts. Beneficial impacts same as Measure 52.	No mitigation necessary.

Notes:
1. Native Hawaiian rights include gathering (PASH): A) invasive Polynesian canoe plants (e.g. kukui nut tree) and other invasive non-native plant species used by cultural practitioners including trees, ferns, flowers, bark, branches, vines and fruit; B) introduced and native animals used for food and cultural practices; and
C) native Hawaiian trees, ferns, flowers, bark, branches, vines and fruit.
2. Existing tools and processes to protect water resources and Native Hawaiian rights and resources are not stated here such as monitoring permit applications and proceedings, public access preservation, conservation land trusts, and other actions. For example, CWRM provides information on its website regarding permitting and notification of public notices, and its staff can be apprised of well use and diversion issues, and the Hawai'i State Ombudsman may be consulted on actions that may potentially affect or harm Native Hawaiian traditional and customary rights or practices.
3. Increased conservation, use of alternative sources (Strategies 39-61) reduce impacts to ground and surface water resources and are therefore generally applicable to a number of strategies. However these strategies are not always referenced as mitigation.

Prepared by County of Maui Department of Water Supply, Water Resources and Planning Division

ACRONYMS

CWRM: Commission on Water Resource Management

DOA: State of Hawai'i Department of Agriculture

DHHL: Department of Hawaiian Home Lands

DLNR: Department of Land and Natural Resources

DWS: Department of Water Supply (Maui County)

GPD: gallons per day

HC&S: Hawaiian Commercial and Sugar Company

HRS: Hawai'i Revised Statutes

HAR: Hawaii Administrative Rules

IFS: Instream Flow Standards

IIFS: Interim Instream Flow Standards

MCDWS, MDWS: Maui County Department of Water Supply

MGD: million gallons per day

MIP: Maui Island Plan

USGS: U.S. Department of the Interior, U.S. Geological Survey

WUDP: Water Use and Development Plan

REFERENCES

Beckwith, Martha. Hawaiian Mythology. The University Press of Hawai'i, Honolulu, 1970.

Carey W. King, Ph. D., *A Systems Approach for Investigating Water, Energy, and Food Scenarios in East-Central Maui.* University of Texas at Austin, November 2013.

Cheng, C.L., *Low-flow characteristics of streams in the Lahaina District, West Maui, Hawai‘i: U.S. Geological Survey Scientific Investigations Report 2014–5087*, 2014, http://dx.doi.org/10.3133/sir20145087

Cheng, C.L., *Low-flow characteristics for streams on the Islands of Kaua‘i, O‘ahu, Moloka‘i, Maui, and Hawai'i, State of Hawai‘i*: U.S. Geological Survey Scientific Investigations Report 2016-5103, 2016, http://dx.doi.org/10.3133/sir20165103.

Cheng, C.L., *Measurements of seepage losses and gains, East Maui Irrigation diversion system, Maui, Hawaii: U.S. Geological Survey Open-File Report 2012–1115,* 2012. http://pubs.usgs.gov/of/2012/1115/of2012-1115_full-text.pdf

Cooper, George, and Gavan Daws. *Land and Power in Hawai'i: The Democratic Years*. Honolulu: University of Hawai’i Press, 1985. Paperback ed., 1990.

County of Maui, Department of Water Supply, *Central/South Maui Desalination Feasibility Study*, *Final Report*. Brown and Caldwell for Department of Water Supply, December 2006.

County of Maui Drought Mitigation Strategies, Wilson Okamoto Corporation, October 2004 (Updated June 2012) for CWRM and Maui Drought Committee.

County of Maui Environmental Management Dept., Wastewater Reclamation Division, Various Reports.

County of Maui Environmental Management Dept., Wastewater Reclamation Division 2013 *Update of the Hawai'i Water Reuse Survey and Report*, State of Hawai'i, 2012.

County of Maui Multi-Hazard Mitigation Plan, Tetra Tech for Maui County Civil Defense Agency, 2015.

County of Maui, Planning Department, Long Range Planning Division, *Socio-Economic Forecast*, 2014 Final.

CWRM, *Declarations of Water Use, Volumes 1 and 2, Circular C-123*, September 1992.

CWRM, 'Iao Ground Water Management Area High-Level Source Water-Use Permit Applications and Petition to Amend Interim Instream Flow Standards of Waihe'e River and Waiehu, ‘Iao, and Waikapu Streams Contested Case No. CCH-MAO6-O1.

CWRM East Maui Streams Contested Case No. CCH-MA 13-01
http://files.hawaii.gov/dlnr/cwrm/cch/cchma1301/CCHMA1301-20160115-HO-D&O.pdf

CWRM Meeting, January 22, 2104.
http://files.hawaii.gov/dlnr/cwrm/submittal/2014/sb201401D1.pdf

CWRM, *Na Wai 'Ehā Provisional Order on Claims That Particular Parcels Have Appurtenant Rights* (CCH-MA 13-02).

CWRM, *Hawai'i Stream Assessment, A Preliminary Appraisal of Hawai'i's Stream Resource*s, 1992, Report R84. http://files.hawaii.gov/dlnr/cwrm/publishedreports/R84_HSA.pdf

CWRM, Staff Submittal June 17, 2016.
http://files.hawaii.gov/dlnr/cwrm/submittal/2016/sb20160617C3.pdf

CWRM Staff Submittal, *Stream Diversion Works Permit (SDWP.4175.6) Wailuku River*, Maui, August 16, 2016.

CWRM, *The State Water Projects Plan Update, Hawai'i Water Plan, Department of Hawaiian Homelands, Advance Final Report*, July 2016.

CWRM Monitoring Data, http://files.Hawai'i.gov/dlnr/cwrm/monitoringdata/dmw_infos.pdf.

CWRM Reports, 2016. *CWRM Water Use Permits for 'Iao Aquifer System Area*, July 18, 2016.

CWRM Well Database.

Department of Health, Safe Drinking Water Branch, Sanitary Surveys.

Department of Land and Natural Resources, State of Hawai'i. *The Rain Follows The Forest Hahai no ka ua i ka ululā'au, A Plan to Replenish Hawaii's Source of Water*, November 2011.

Department of Hawaiian Home Lands (DHHL), Maui Island Plan and Regional Plans.

Division of Aquatic Resources Aquatic Surveys Database.
http://www.Hawai'i.gov/dlnr/dar/streams/stream_data.htm

EcoAdapt. *Climate Changes and Trends for Maui, Lāna'i, and Kaho'olawe.* Prepared for the Hawaiian Islands Climate Synthesis Project, 2016.

Effects of Agricultural Land-Use Changes and Rainfall on Ground Water Recharge in Central and West Maui, U.S. Department of the Interior, U.S. Geological Survey for County of Maui

Department of Water Supply, 1926-2004.

Federal Safe Drinking Water Act

Forman, David M., Susan K. Serrano. *Ho'ohana Aku, a Ho'ola Aku: A legal primer for Traditional and Customary Rights in Hawai'i,* 2012.

Garza, J.A., P.-S. Chu, C.W. Norton, and T.A. Schroeder *Changes of the prevailing trade winds over the islands of Hawai'i and the North Pacific. Journal of Geophysical Research*, 117, D11109, doi:10.1029/2011JD016888, (2012).

Gingerich, S.B., and Engott, J.A., 2012, *Groundwater availability in the Lahaina District, West Maui, Hawaii: U.S. Geological Survey Scientific Investigations Report 2012–5010*.

Gingerich, S.B., 2005, *Median and Low-Flow Characteristics for Streams under Natural and Diverted Conditions, Northeast Maui, Hawaii: Honolulu, HI, U.S. Geological Survey, Scientific Investigations Report 2004-5262*, http://pubs.usgs.gov/sir/2004/5262/pdf/sir2004-5262.pdf

Gingerich, S.B. and Oki, D.S., 2000, *Ground Water in Hawai'i: U.S. Geological Survey, Fact Sheet 126-00.*

Gingerich, S.B., Yeung, C.W., Ibarra, T.N., and Engott, J.A., 2007, *Water use in wetland kalo cultivation in Hawai'i: U.S. Geological Survey Open-File Report 2007-1157*.

Grubert, King and Webber, *Water for Biomass-based Energy on Maui, Hawaii*, 2011, http://www.academia.edu/1645956/Water_for_Biomass-based_Energy_on_Maui_Hawaii

Haia, Moses. *Protecting and Preserving Native Hawaiian Water Rights*. University of Hawai'i at Manoa http://www.hawaii.edu/ohelo/resources/AluLikeWorkbook/Chap7.pdf

Hawai'i Drought Plan, 2005 Update, State of Hawai`i Department of Land & Natural Resources, Commission on Water Resource Management.

Hawai'i Administrative Rules (HAR)

Hawai'i Community Foundation, *Hawai'i Fresh Water Initiative, A Blueprint for Action: Water Security for an Uncertain Future, 2016 – 2018*, 2015 http://www.Hawaiicommunityfoundation.org/strengthening/fresh-water

Hawai'i Data Book, Department of Business, Economic Development and Tourism (DBEDT).

Hawai'i Department of Agriculture (HDOA), 2/29/16. http://hdoa.hawaii.gov/wp-content/uploads/2013/02/IAL-voluntary-summary-e14_rev2-29-16.pdf

Hawai'i Department of Agriculture (HDOA), *Agricultural Water Use and Development Plan (AWUDP) update presentation*, October 23, 2013 HWWA Conference.

Hawai'i Fresh Water Initiative, *A Blueprint for Action, Water Security for an Uncertain Future*, 2016-2018, Hawai'i Community Foundation.

Hawaii Revised Statutes (HRS)

Hawai'i State Planning Act, Chapter 226 HRS Climate Adaption Guidelines

Hawai'i Stormwater Reclamation Appraisal Report. CH2MHill, prepared for the U.S. Bureau of Reclamation and the State of Hawai'i CWRM, July 2005.

Hawaii Stream Assessment: A preliminary Appraisal of Hawai'i's Stream Resources. State of Hawai'i Commission on Water Resources Management, National Park Service Rivers and Trails Conservation Assistance Program, 1990.*Hawai'i Stream Assessment*, Report R84, State of Hawai'i Commission on Water Resources Management, December 1990.

Hawai'i Water Conservation Plan, CH2MHill, prepared for the U.S. Bureau of Reclamation and the State of Hawai'i CWRM, 2013.

Hawai'i Water Plan: *Water Resources Protection Plan.* State of Hawai'i, Commission on Water Resources Management, June 2008.

Hawai'i Water Plan: *Water Quality Plan,* Hawai'i Department of Health, 2014.

Hawai'i Water Plan: *State Water Projects Plan,* Department of Land and Natural Resources, 2015.

Hawai'i Water Plan: *Agricultural Water Use and Development Plan,* State of Hawai'i department of Agriculture (AWUDP), 2003.

Hawai'i Water Plan*: Statewide Framework for Updating the Hawai'i Water Plan.* Commission on Water Resources Management.

Interim Instream Flow Standards (IIFS) adopted for both East and West Maui Streams, 1988, (Sections 13-169-44 and 48, Hawai'i Administrative Rules. According to Section 13-169-46, Hawai'i Administrative Rules).

I'i, John Papa. *Fragments of Hawaiian History.* B.P. Bishop Museum Press: Honolulu, 1959.

Izuka, S.K., Engott, J.A., Bassiouni, Maoya, Johnson, A.G., Miller, L.D., Rotzoll, Kolja, and Mair, Alan, 2016, *Volcanic aquifers of Hawai'i—hydrogeology, water budgets, and conceptual models: U.S. Geological Survey Scientific Investigations Report 2015-5164*, 158 p., http://dx.doi.org/10.3133/sir20155164.

Johnson, A.G., Engott, J.A., and Bassiouni, Maoya, 2014, *Spatially distributed groundwater recharge estimated using a water-budget model for the Island of Maui, Hawai'i, 1978–2007: U.S. Geological Survey Scientific Investigations Report 2014–5168,* 53 p., http://dx.doi.org/10.3133/sir201451

Kamakau, Samuel M. *Ruling Chiefs of Hawai'i.* The Kamehameha Schools Press: Honolulu (2 vols.), 1961.

Kamakau, Samuel Manaiakalani. *The Works of the People of Old: Na Hana a ka Po'e Kahiko*. Translated from the newspaper Ke Au okoa by Mary Kawena Pukui; arranged and edited by Dorothy B. Barrere. [Honolulu]: Bishop Museum Press, 1976.

Kame'eleihiwa, Lilikala. *Native Land and Foreign Desires,* Honolulu: Bishop Museum Press, 1992.

Ko'olau Poko Watershed Management Plan. Honolulu Board of Water Supply, 2012.

Ladefoged, T.N., et al., *Opportunities and constraints for intensive agriculture in the Hawaiian archipelago prior to European contact*, J. Archaeol. Sci. (2009), doi:10.1016/j.jas.2009.06.030

Malo, David. *Hawaiian Antiquities*. Bishop Museum Press, Honolulu, 1959.

Maui County Community Plans, Maui County Planning Department.

Maui County Code.

Maui County General Plan, Maui County Planning Department.

Maui Island Plan, Maui County Planning Department.

Maui Island Water Source Development Options for the Lahaina-Napili Area, County of Maui, Department of Water Supply, March 6, 2013.

Maui County Planning Department, *Socio-Economic Forecast*, July 2014

Matsuoka, Jon K. *Native Hawaiian Ethnographic Study For the Hawai'i Geothermal Project Proposed for Puna and Southeast Maui*. Oak Ridge; Oak Ridge National Laboratory.

Maupin, M.A., Kenny, J.F., Hutson, S.S., Lovelace, J.K., Barber, N.L., and Linsey, K.S., 2014*, Estimated use of water in the United States in 2010: U.S. Geological Survey Circular 1405, 56 p., http://dx.doi.org/10.3133/cir1405*

Maui County Office of Economic Development presentation, Maui County Council Budget and Finance Committee, November 3, 2015.

Maui County Department of Water Supply (MDWS) Reports.

Maui County of Department of Water Supply (MDWS), Maui Island Water Source Development Study, February 11, 2013.

Maui Economic Development Board, *County of Maui Comprehensive Economic Development Strategy*, December 2016.

Melrose, J., Perroy, R., and Cares, Sylvana, 2015. *Statewide Agricultural Land Use Baseline 2015*: Hawai'i Department of Agriculture. https://hdoa.Hawai'i.gov/wp-content/uploads/2016/02/StateAgLandUseBaseline2015.pdf

Miike, Lawrence. *Water and the Law in Hawai'i.* University of Hawai'i Press, 2004.

Native Hawaiian Rights Handbook. Edited by Melody Kapilialoha MacKenzie. Honolulu: Native Hawaiian Legal Corporation; Office of Hawaiian Affairs. Distributed by University of Hawai'i Press, 1991.

Native Hawaiian Access Rights Project Phase III. Recommendations for SMA Rules and Process. A Publication of the Hawai'i Coastal Zone Management Program Office of Planning Department of Business, Economic Development and Tourism State of Hawai'i Pursuant to National Oceanic and Atmospheric Administration (NOAA) Award Nos. NA970Z0161 and NA070Z0115 Final Report December 15, 2002 Daviana Pomaika'i McGregor, Jon Matsuoka, Luciano Minerbi and Panaewa Kelley Univeristy of Hawai'i, Manoa Honolulu, Hawai'i.

Office of Hawaiian Affairs, Data Book.

Oki, D.S., *Surface Water in Hawai'i: U.S. Geological Survey Fact Sheet 045-03*, 2003. https://pubs.usgs.gov/fs/fs04503/pdf/fs045-03.pdf

Oki, D.S., 2004, *Trends in Streamflow Characteristics at Long-Term Gaging Stations*, Hawaii: U.S. Geological Survey Scientific Investigations Report 2004-5080, 120 p., http://pubs.usgs.gov/sir/2004/5080/

Oki, D.S., Wolff, R.H., and Perreault, J.A., 2010, *Effects of surface-water diversion on streamflow, recharge, physical habitat, and temperature, Nā Wai 'Ehā, Maui, Hawai'i: U.S. Geological Survey Scientific Investigations Report 2010–5011*,

Pacific RISA. *Participatory Scenario Planning for Climate Change Adaption: Final Land Use Input, November, 2014*

Brown and Caldwell, et al. *Blueprint for One Water*. Water Research Foundation, 2017.

Pukui, Mary K., Samuel H. Elbert, and Esther T. Mookini. *Place Names of Hawai'i*. The University Press of Hawai'i: Honolulu, 1976.

Richard Wallsgrove and David Penn, *Water Resources and Climate Change Adaptation in Hawai'i: Adaptive Tools in the Current Law and Policy Framework*, (Center for Island Climate Adaptation and Policy, Honolulu, Hawai'i, 2012), http://icap.seagrant.soest.hawaii.edu/icap-publications *and* www.islandclimate.org

Sproat, D. Kapuaala, Ola I Ka Wai: *A legal Primer for Water Use and Management in Hawai'i.* Ka Huli Ao Center for Excellence in Native Hawaiian Law, William S. Richardson School of Law, *2014.*

State of Hawai'i, *Statewide Framework for Updating the Hawai'i Water Plan,* 2010.

State of Hawai'i, *Agricultural Water Use and Development Plan*, 2004

State of Hawai'i Department of Land and Natural Resources, *Maui Parties Reach Agreement In Na Wai 'Eha Amended Interim Instream Flow Water Case***;** Press Release, April 21, 2014. http://files.Hawai'i.gov/dlnr/cwrm/news/2014/nr20140421.pdf (May 2015)

State of Hawai'i, Data Book, DBEDT, 12/31/2014.

State of Hawai'i, Water Code, Hawai'i Revised Statutes Chapter 174C.

State of Hawai'i, Water Projects Plan, 2003.

State of Hawai'i, *Water Resources Protection Plan Update*, 2014. http://files.Hawai'i.gov/dlnr/cwrm/planning/wrpp2014update/WRPP-2014Ch8SummaryDroughtPlanning.pdf

State of Hawai'i, *Water Projects Plan Update, Hawaii Water Plan*, *Advance Final Report,* Department of Hawaiian Homelands, July 2016.

State of Hawai'i *Water Projects Plan, 2016 Advance Report.*

State of Hawai'i *Water Projects Plan* Hawai'i Water Plan, Volume 4, SWPP for Islands of Lanai/Maui/Moloka'i, 2003.

State of Hawai'i, *2013 Update of the Hawai'i Water Reuse Survey and Report*.

Sterling, Elspeth P. *Sites of Maui.* Bishop Museum Press, 1997.

The Nature Conservancy, GIS data, Opportunities and constraints for intensive agriculture in the Hawaiian archipelago prior to European contact, and Estimated Native Hawaiian Pre-contact Land Utilization Footprint

The Pacific Islands Regional Climate Assessment (2012), East-West Center, the Department of Interior's Pacific Islands Climate Science Center, the Pacific Islands Climate Change Cooperative, and the National Oceanic and Atmospheric Administration through the Pacific Regional Integrated Sciences and Assessments (RISA) Program.

University of Hawai'i at Manoa, *Rainfall Atlas of Hawai'i*, 2011.

U.S. Census Bureau Data.

USGS, The USGS Water Science School. Website: http://water.usgs.gov/edu/hydrology.html.

USGS, Pacific Islands Water Science Center. Recent hydrologic conditions, Lahaina District, Maui, Hawai'i. Website: http://hi.water.usgs.gov/recent/lahaina/index.html

University of Hawai'i at Manoa Sea Grant College Program. *Climate Change Impacts in Hawai'i - A summary of climate change and its impacts to Hawai'i's ecosystems and communities,* 2014.

US Army Corp of Engineers, State of Hawai'i, DNLR, *West Maui Watershed Plan: Kahana, Honokahua and Honolua Watersheds Characterization Report,* Public Review Draft, March 2105.

Waiahole Water Case, and a fourth in its 2004 decision, *In the Matter of the Contested Case Hearing on Water Use, Well Construction, and Pump Installation Permit Applications,* filed by Waiola o Moloka'i, Inc. and Moloka'i Ranch, Limited.

REFERENCES CONSERVATION SECTION

Agricultural Water Conservation Clearinghouse (AWCC).
http://agwaterconservation.colostate.edu/

Amy Vickers, Mary Wyatt Tiger & Shadi Eskaf. AWWA*. Guide to Customer Water-Use Indicators for Conservation and Financial Planning, October 2013*.
http://www.awwa.org/Portals/0/files/resources/resource%20dev%20groups/tech%20and%20educ%20program/documents/Water%20Use%20Indicators%20for%20Conservation%20and%20Financial%20Planning.pdf

AWWA, *Water Conservation Programs—A Planning Manual, Manual of Water Supply Practices, M52*, 2006.

Benedykt Dziegielewski and Jack C. Kiefer. *Appropriate design and evaluation of water use and conservation metrics and benchmarks,* June 2010, Journal AWWA 102:6*.*
http://www.awwa.org/publications/journal-awwa/abstract/articleid/24576/issueid/33569333.aspx?getfile=\\pers75apppcr\personify\serverfiles\dcdfiles\24576\waternet.0072065.pdf

DeOreo, William B. and Mayer, Peter W. *Insights into declining single-family residential water demands,* Journal - American Water Works Association, 2012.
http://dx.doi.org/10.5942/jawwa.2012.104.0080

DeOreo, William B. et al. *The Residential End Uses of Water, Executive Report, Version 2*, Water Research Foundation*,* 2016.
http://www.waterrf.org/PublicReportLibrary/4309A.pdf
http://www.allianceforwaterefficiency.org/residential-end-uses-of-water-study-1999.aspx

Dziegielewski, Ben and Jack C. Kiefer*. The American Water Works Association Water Conservation Division Subcommittee Report, January 2010, WATER CONSERVATION*

MEASUREMENT METRICS, Guidance Report.
http://www.awwa.org/portals/0/files/resources/resource%20dev%20groups/tech%20and%20educ%20program/documents/waterconservationmeasurementmetricsguidancereport.pdf

Fares, Ali, Ph.D., CTAHR, UHM. Irrigation Water Requirement Estimation Decision Support System (IWREDSS) to Estimate Crop Irrigation Requirements for Consumptive Use in Hawaii, Final Report prepared for CWRM, August 2013.
http://files.hawaii.gov/dlnr/cwrm/publishedreports/PR200808.pdf

Freedman, Carl, Haiku Design and Analysis. Maui County Water Use and Development Plan, Central DWS District Update, Nov. 16, 2010.

Freedman, Carl, Haiku Design and Analysis. Maui County Water Use and Development Plan, Upcountry Final Candidate Strategies WAC Draft, July 27, 2009.

Maui Tomorrow, Malama `Aina: A Conversation About Maui's Future, March 8, 2016.

USDA-NRCS, National Engineering Handbook, Part 623, Irrigation, Chapter 2, Irrigation Water Requirements, 1993. https://policy.nrcs.usda.gov/RollupViewer.aspx?hid=17092

USEPA. *USEPA Water Conservation Plan Guidelines, Appendix B.*
https://www3.epa.gov/watersense/docs/app_b508.pdf

US EPA, WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities, October 2012.

U.S. Environmental Protection Agency, Office of Water. *WaterSense at Work: Best Management Practices for Commercial and Institutional Facilities*, October 2012.
https://www3.epa.gov/watersense/docs/ws-at-work_bmpcommercialandinstitutional_508.pdf

USDA, National Institute of Food and Agriculture, Agriculture Technology. Accessed March 17, 2017 https://nifa.usda.gov/topic/agriculture-technology